TSA-IC300/301
User’s Manual

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- Please handle this product as you would a CMOS device. The user should be particularly careful to protect him/herself from accumulated static electricity when using this product.
- Make sure all test and measurement equipment, including the work station, is properly grounded.
- The user should wear an ESD wrist strap to prevent any buildup of static electricity.
- Do not touch the device pins with bare hands.
-

1. Overview

1.1 Document Overview

This document provides the hardware specifications, software configuration, and USB driver installation instructions for Tessera Smart Analog evaluation boards TSA-IC300 and TSA-IC301. It also provides an example analog front end (AFE) circuit design using an on-board Hall sensor. Unless otherwise stated, all information here is applicable to both TSA-IC300 and TSA-IC301.

1.2 Related Terminology

This manual uses the following terms in explanations of hardware specifications and software descriptions.

Table 1.1 Terminology

Term	Definition
Smart Analog	Product lineup with software configurable circuits and characteristics supporting various types of sensors and drivers.
Smart Analog IC	Smart Analog silicon molded in a plastic package.
Smart Analog IC300	Renesas Electronics Smart Analog IC300 - Circuit type: configurable - Part number: RAA730300
Smart Analog IC301	Renesas Electronics Corp. Smart Analog IC301 - Circuit type: general-purpose instrumentation amplifier - Part number: RAA730301
Smart Analog Easy Starter	Renesas Electronics Smart Analog evaluation tool, also called SA Easy Starter
E1 Emulator	Renesas Electronics on-chip debugging emulator, also works as a Flash programmer (sold separately)
CubeSuite+	Integrated development environment for developing and debugging Renesas Electronic MCU software
Renesas Flash Programmer (RFP)	Programming software tool for Renesas Electronics Flash MCUs

1.3 TSA-IC300 and TSA-IC301 Features

- Dedicated for Renesas Electronics Smart Analog IC evaluation

(TSA-IC300 is for evaluating Smart Analog IC RAA730300; TSA-IC301 is for evaluating Smart Analog IC RAA730301)

- RL78/G1A (F5F1ELEAFB) MCU is employed for on-board Smart Analog IC control
- Power supply: select power from USB, external supply, or E1
- Comes mounted with Hall sensor (HW-300B manufactured by Asahi Kasai Microdevices)
- Monitor sensor operations using *Smart Analog Easy Starter* software
- Expandable for additional sensors

1.4 Product Overview

This product is configured with the following.

- TSA-IC30x board
- User's Manual
- Related documentation
  Includes download URL for Usage Notes and Smart Analog Easy Starter
  Please read these documents before using the TSA board.
- USB cable (Mini-B type)

The board's external picture is shown in Figure 1.1.

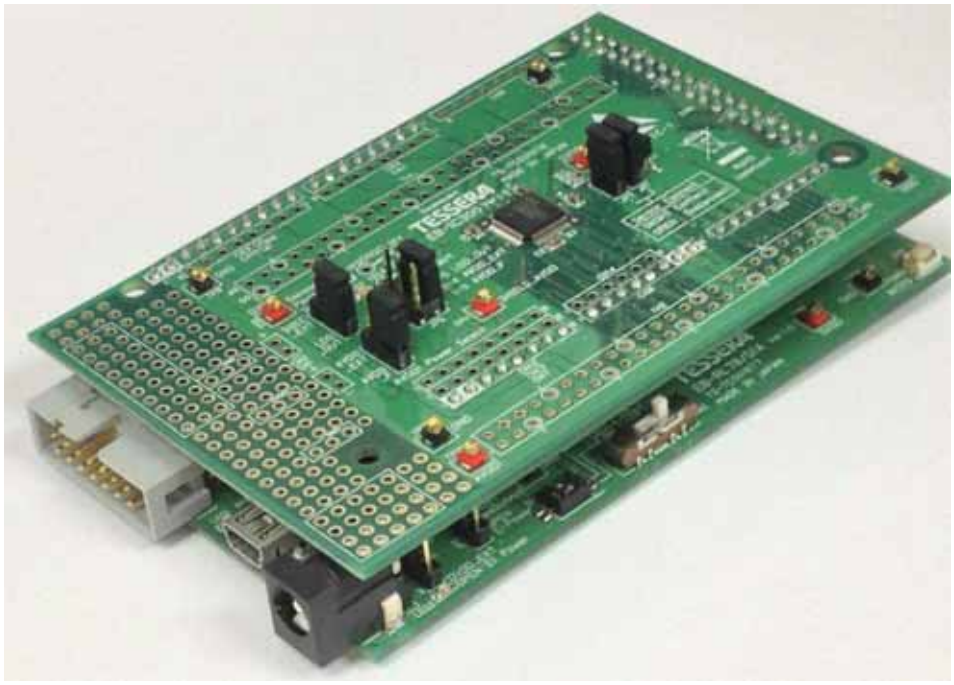


Figure 1.1 TSA-IC30x External Picture

Figure 1.2 shows an example of TSA board operations. Engineers can readily use Smart Analog Easy Starter PC software to configure parameters and connections of the RAA730300/RAA730300 analog blocks.

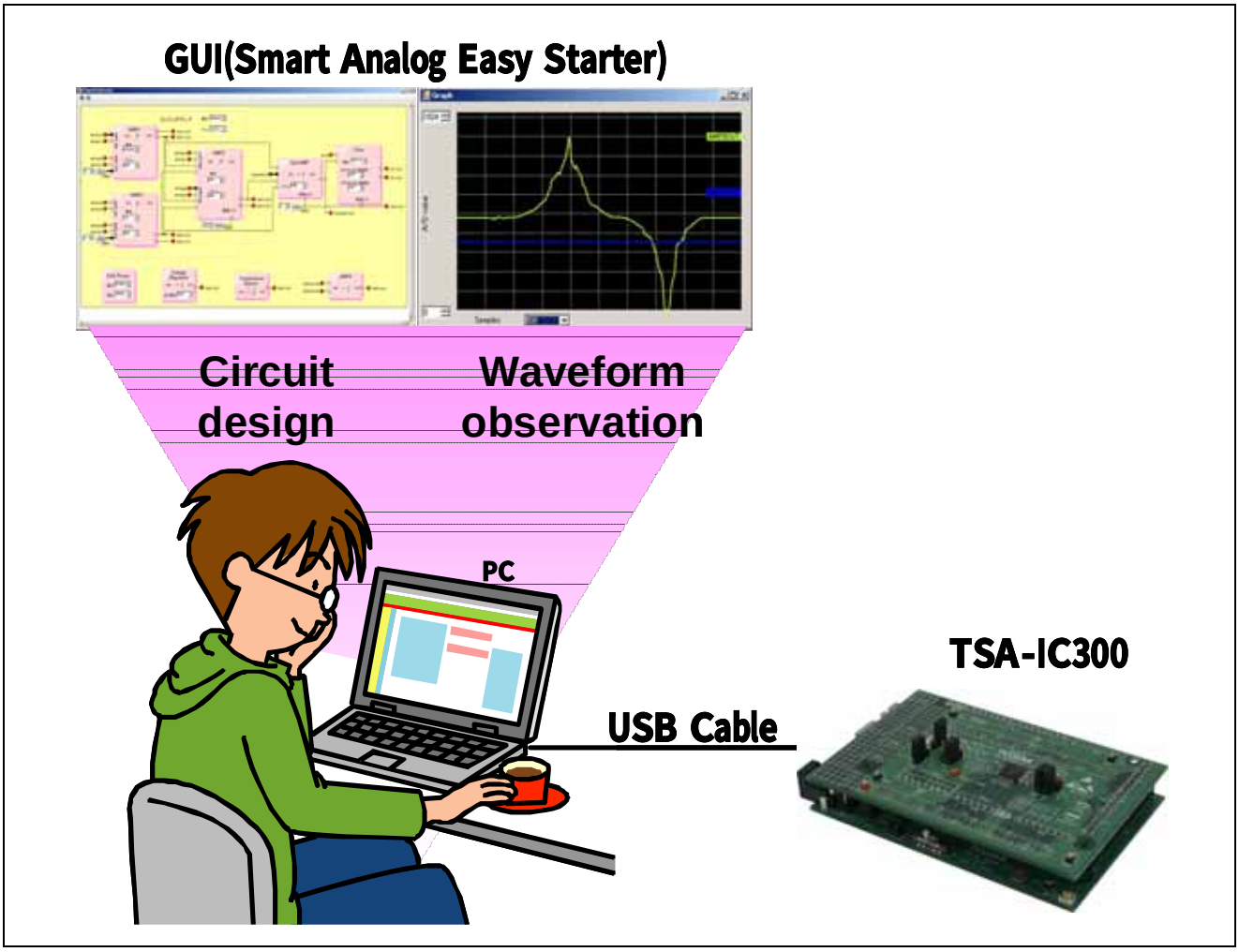


Figure 1.2 TSA Board User Operation Setup

2. Hardware

2.1 Hardware Specifications

Table 2.1 shows the hardware specifications for the TSA board.

Table 2.1 Hardware Specifications for TSA-IC300/TSA-IC301

Spec Item	Description	
Product configuration	TSA-IC300	Double-deck configuration: CPU board (EB-RL78/G1A) + Smart Analog board (EB-IC300)
	TSA-IC301	Double-deck configuration: CPU board (EB-RL78/G1A) + Smart Analog board (EB-IC301)
Mounted Smart Analog IC	TSA-IC300	Renesas Electronics Smart Analog IC300 - Part number: RAA730300 - Circuit type: configurable
	TSA-IC301	Renesas Electronics Smart Analog IC301 -Part number: RAA730301 -Circuit type: general-purpose instrumentation amplifier
CPU Mounted CPU	Renesas Electronics RL78/G1A MCU -Part number: R5F10ELEAFB - Memory size: Flash ROM 64KB / RAM 4KB / Data Flash 4KB	
Mounted CPU frequency	Main system clock: High-speed on-chip oscillator 1 to 32 MHz Low-speed on-chip oscillator 15 kHz Sub-system clock: oscillator 32.768 kHz	
Interface	USB Connector（Mini-B） External power-supply connector E1 emulator connector Sensor extension I/F connector (50 pins) MCU extension I/F connector (50 pins)	
Sensor input pins	TSA-IC300	12 pins: MPXIN10/11/20/21/30/31/40/41/50/51/60/61 Input up to ($AVDD_1$+0.1)V in rail-to-rail input mode Input voltage when using P-ch single input mode: $AVDD_1$ - 1.4 V
	TSA-IC301	Three sets of differential input: AMPINP0/AMPINM0, AMPINP1/AMPINM1, and AMPINP2/AMPINM2 Input voltage when using rail-to-rail input mode: $AVDD_1$ + 0.1 V Input voltage when using P-ch single input mode: $AVDD_1$ - 1.4 V
Supply Voltage	+5.0V (USB bus power/external power supply) or +3.3V (from E1)	
Display	LED	
Mounted sensor	Hall Sensor HW-300B (Asahi Kasai Microdevices)	
Dimensions	Board dimensions 100 x 65 x15mm（W x D x H）	

2.2 Block Diagram

The TSA-IC300/301 block diagram is shown below.

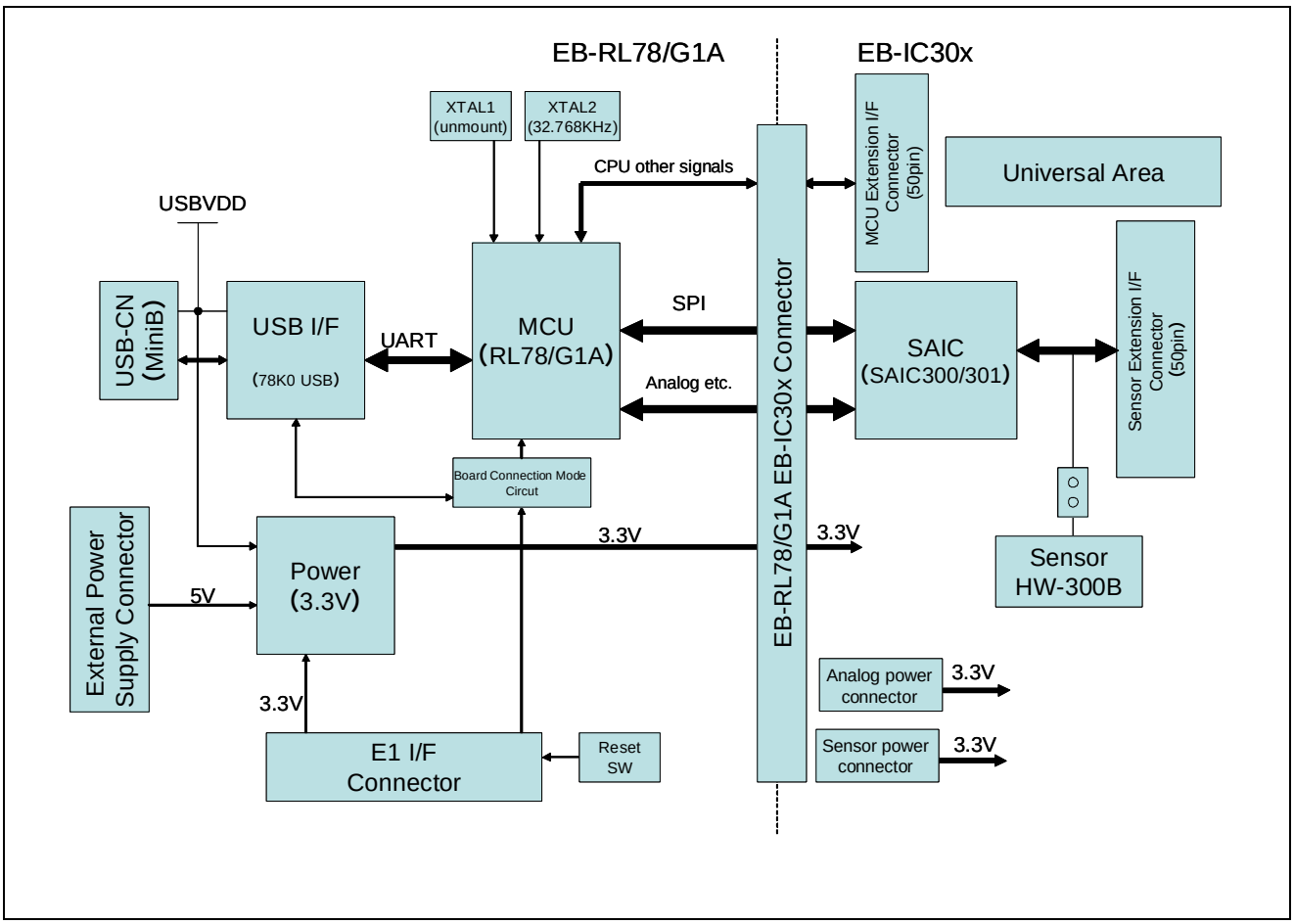


Figure 2.1 TSA-IC300/301 Block Diagram

The TSA-IC30x is a double-decked board configuration. The bottom board, EB-RL78/G1A, employs the RL78/G1A MCU for configuring Smart Analog ICs. The top board, EB-IC300/301, employs Smart Analog IC300/IC301, respectively. Power supply can be selected from the USB bus power, external power supply or E1 power. Connectors are provided for powering analog circuits and sensor devices externally.

2.3 Description of Key Components

Key components comprising EB-RL78/G1A are described below.

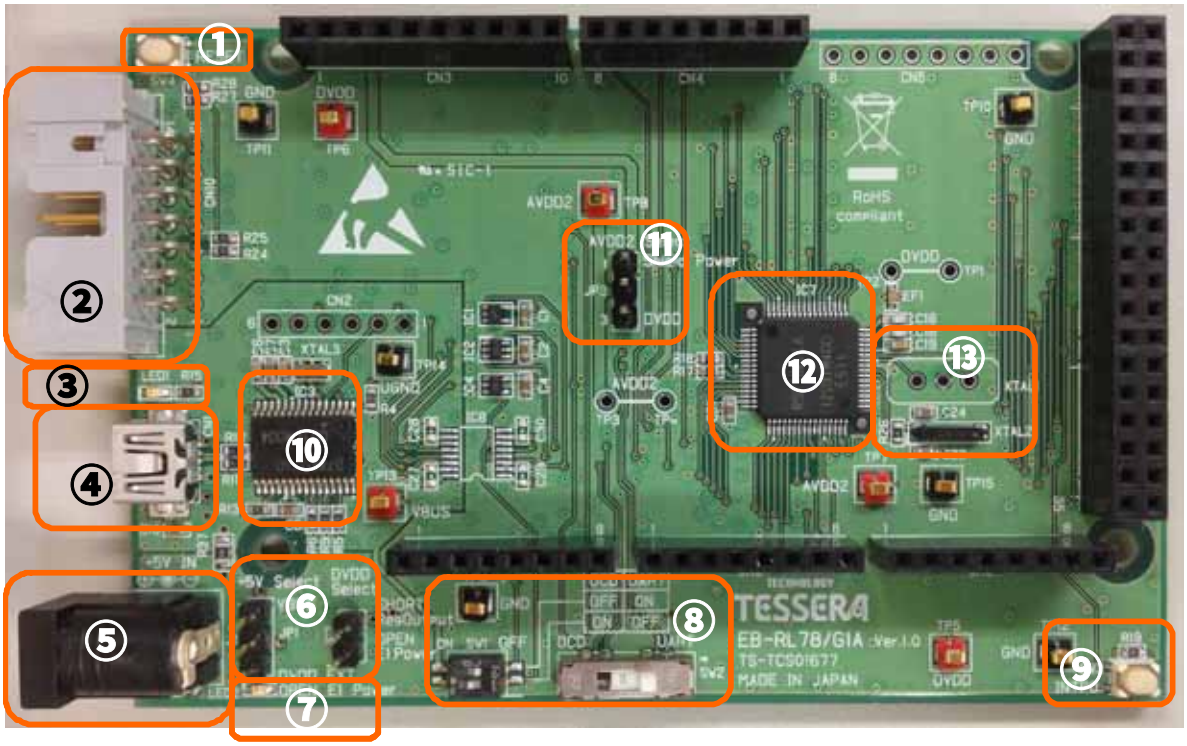


Figure 2.2 EB-RL78/G1A Key Component Positions

No.	Ref.	Component	Function
①	SW4	Reset switch	Board reset switch
②	CN10	E1 I/F connector	Connector for connecting the E1 emulator
③	LED1	USB power supply LED	Turns on when USB power is supplied
④	CN1	USB I/F connector	Connector for USB (Mini-B) cable connection
⑤	J1	External power jack	Power jack for connection to external power source
⑥	JP1	+5V/power supply select jumper	Selects main power supply
	JP2	Digital power supply select jumper	Selects RL78/G1A digital power supply
⑦	LED2	External power supply LED	Turns on when external power is supplied via power jack
⑧	SW1	Mode switches	Must be configured according to the debug application software used on the PC.
	SW2		
⑨	SW3	Function switch	Switch connected to INTP0 pin on RL78/G1A
⑩	IC3	USB controller	USB controller (μPD78F0730MC-CAB-AX)
⑪	JP3	Analog power supply select jumper	Selects RL78/G1A analog power supply
⑫	IC7	CPU	RL78/G1A
⑬	XTAL1	Clock	3-pin oscillator (not mounted) for main clock
	XTAL2		32.768 kHz oscillator for sub-clock

Key components comprising EB-IC30x are described below.

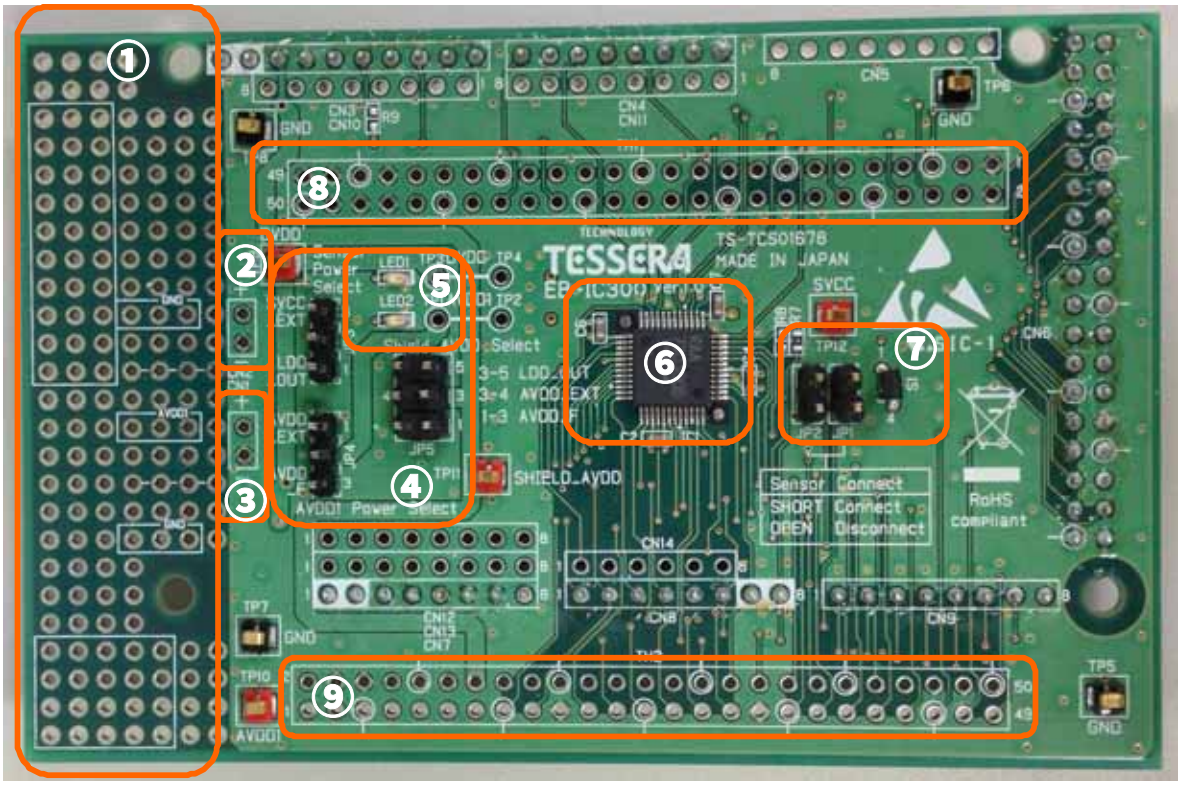


Figure 2.3 EB-IC30x Key Component Positions

No.	Ref.	Component	Function
①	–	Universal area	Area for mounting additional sensors
②	CN2	Sensor power connector	Connector for supplying power to sensors (not mounted)
③	CN1	Analog power connector	Connector for connecting an external analog power supply (not mounted)
④	JP3	Sensor power supply selection jumper	Selects one of two power supplies for Hall sensor
	JP4	Analog power supply selection jumper	Selects one of two power supplies for Smart Analog IC
	JP5	Analog power supply select jumper RL78/G1A	Selects one from three power supply sources for the RL78/G1A analog block.
⑤	LED1	Digital power-charged LED	Turns on when the digital power is supplied
	LED2	Analog power-charged LED	Turns on when the analog power is supplied
⑥	IC1	Smart Analog IC	Smart Analog IC300 or 301
⑦	S1	Sensor	Hall Sensor HW-300B
	JP1	Sensor connection jumper	For connecting Smart Analog IC and the mounted sensor
	JP2		
⑧	TH1	MCU extension I/F connector	Connector for adding an external smart analog IC board.
⑨	TH2	Sensor extension I/F connector	Connector for adding an external sensor board

2.4 Board Functions

2.4.1 Power Supply

Various power sources can be used for digital and analog powers of the SA-IC MCU and sensor on the TSA board. Jumpers J1 to J5 define the power supply selection.

Table 2.2 Settings for Power Supply Selections

Board	JP	Function	Power supply destination	JP Setting	Name of power supply source	Power supply source
EB-RL78/G1A	JP1	+5V Select	+5V	①-②	VBUS	USB power supply.
				②-③	DVDD_EXT	External power jack (J1)
	JP2	DVDD Select (RL78/G1A digital power)	DVDD	①-②	Regulator Output	+3.3V Regulator Output.
				OPEN	E1 Power	Power supplied from the E1 emulator. (+3.3V※1)
	JP3	AVDD2 Select (RL78/G1A analog power)	AVDD2	①-②	SHIELD_AVDD	Power that is selected in the JP5 of EB-IC300/301.
				②-③	DVDD	Power that is selected in the JP2 of EB-RL78/G1A.
EB-IC30x	JP3	Sensor Power Select	SVCC	①-②	LDO_OUT	LDO output supply of Smart Analog IC. ※2
				②-③	SVCC_EXT	Sensor power connector (CN2) ※3
	JP4	AVDD1 Select (Smart Analog IC300/301 Analog Power)	AVDD1	①-②	AVDD_EXT	Analog power connector (CN1)
				②-③	AVDD_F	Power that is selected in the JP2 of EB-RL78/G1A.
	JP5	SHIELD_AVDD Select (RL78/G1A Analog Power)	SHIELD_AVDD	①-③	AVDD_F	Power that is selected in the JP2 of EB-RL78/G1A.
				③-④	AVDD_EXT	Analog power connector (CN1)
				③-⑤	LDO_OUT	LDO output supply of Smart Analog IC. ※2

■ Jumpers on the EB-RL78/G1A board

■ Jumpers on the EB-IC30x board

※1 When using E1 power feed: Use +3.3V from the E1 emulator. Do not use +5V output.

※2 Adjust the LDO output not to exceed +2V.

※3 Apply power not to exceed +2V.

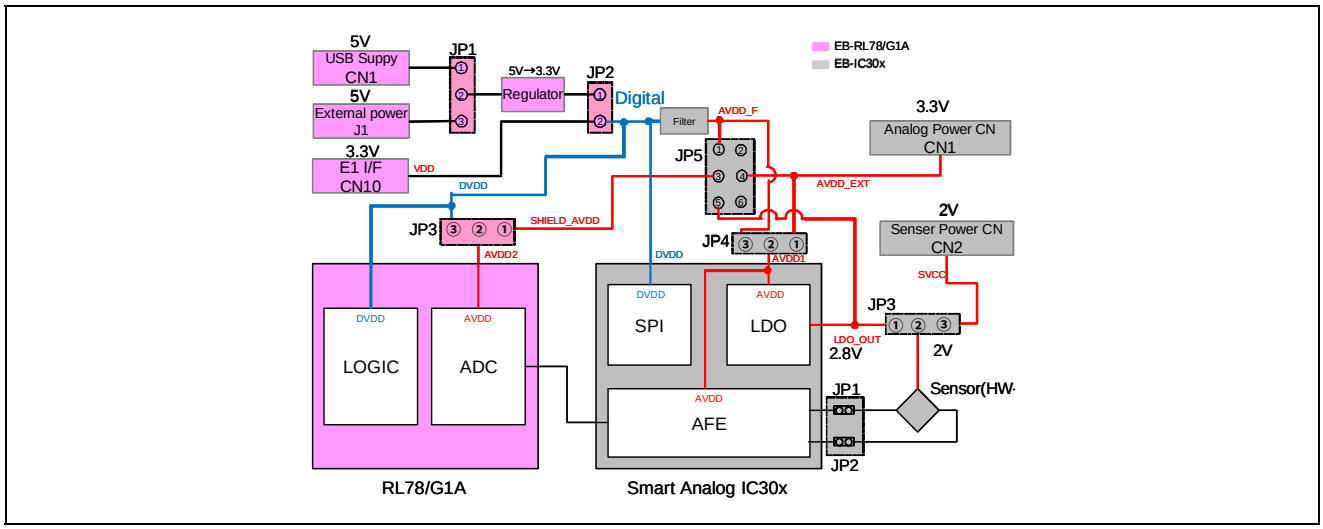


Figure 2.4 Power Supply Source Selection Diagram

The following table shows the jumper settings on the EB-RL78/G1A board corresponding to power sources used for the TSA board.

Table 2.3 Digital Power Selection (on EB-RL78/G1A)

Digital power supply source	JP Setting	
	JP1	JP2
USB power supply	①-② SHORT	①-② SHORT
Power supply from external power jack.	②-③ SHORT	①-② SHORT
Power supply from the E1 emulator.	①-② SHORT	OPEN
	②-③ SHORT	OPEN

The following table shows jumper settings on the EB-IC30x board corresponding to power sources used for the on-board sensor.

Table 2.4 Power Supply Selection for On-board Sensor (on EB-IC30x)

Sensor power supply source	JP Setting
	JP3
Power supply from the LDO regulator of Smart Analog IC.	①-② SHORT
Power supply from Sensor power connector (CN2)	②-③ SHORT

The following table shows jumper settings for power sources used for the analog block of the RL78/G1A MCU.

Table 2.5 Analog Power Supply Selection for RL78G/G1A Analog Block (on both EB-RL78/G1A and EB-IC30x)

RL78/G1A Analog Power supply source	JP Setting	
	JP5	JP3
Power supply from digital power that passes through the filter.	①-③ SHORT	①-② SHORT
Power supply from Analog power connector (CN1)	③-④ SHORT	①-② SHORT
Power supply from Sensor power connector (CN2)	③-⑤ SHORT	①-② SHORT
Power supply from digital power.	One of the above	②-③ SHORT

Specific LEDs turn on when the corresponding power is fed to the boards. The following table lists each board, LEDs and respective power supply selection status.

Table 2.6 LED and Power Supply Status

Board	LED	Power Source to Turn on respective LED
EB-RL78/G1A	LED1	Connected to PC via USB cable (USB-bus power feed)
	LED2	+5V applied via an external power jack (external power feed)
EB-IC30x	LED1	DVDD power applied
	LED2	AVDD1 power applied

2.4.2 Board Connection Mode and Switch Setting

The TSA evaluation board allows the user to switch the PC connection modes by setting SW1 and SW2 to enable USB connection with various evaluation and development tools. Table 2.7 provides a description of each connection mode and Table 2.8 shows the various settings. Default settings at shipping are indicated in bold characters in Table 2.8.

Table 2.7 Board Connection Modes

Connection Mode	Description of Operation
UART	This mode is used for connecting the PC and RL78/G1A in UART. It must be selected when using the Smart Analog Easy Starter software and a user program.
OCD	This mode is used for connecting the PC and the board via USB when writing a program to the CPU or debugging. This mode must be selected when using CubeSuite+ (EZ Emulator).

Table 2.8 モード設定 Connection Mode Settings

Connection Mode	Applicable Board	Switch Setting	Applicable Software Tools	Functions
UART	EB-RL78/G1A	**SW1-2 = ON** **SW1-1 = OFF** **SW2 = UART**	Smart Analog Easy Starter	SA-IC default firmware is pre-programmed before shipment
OCD		SW1-2 = OFF SW1-1 = ON SW2 = OCD	CubeSuite+ (EZ Emulator)	Uses "78K0 USB" MCU controller for simple debugging and flash programming
			RFP (COMx)	Uses "78K0 USB" MCU controller for flash programming

*Do not use switch combinations other than listed above.

*Use UART mode when using the E1 Emulator.

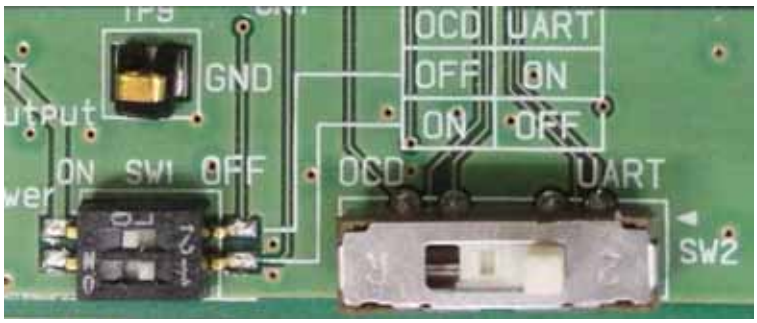


Figure 2.5 Mode Switch: UART Mode

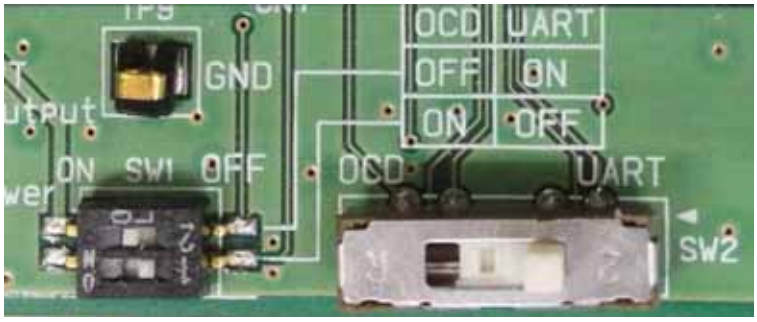


Figure 2.6 Mode Switch: OCD Mode

2.4.3 Evaluation Circuit

The following describes the evaluation circuit mounted on the TSA board.

2.4.3.1 Switches

Table 2.9 Switch Functions

Board	Ref.	Function
EB-RL78/G1A	SW1	OCD/UART mode selection switch 1 Refer to 2.4.2 Connection Mode and Switch Setting for more details
	SW2	OCD/UART mode selection switch 2 Refer to 2.4.2 Connection Mode and Switch Setting for more details
	SW3	Connected to INTP0 pin on RL78/G1A When the switch is open, the INTP0 pin input level is high; when pushed, the INTP0 input level turns to low.
	SW4	Switch connected to RESET pin on the RL78/G1A MCU When the switch is open, the RESET pin is high. And when pushed, the RESET pin turns low to enable the CPU reset. *SW4 cannot be used when using EZ Emulator. Use the debugger reset instead.

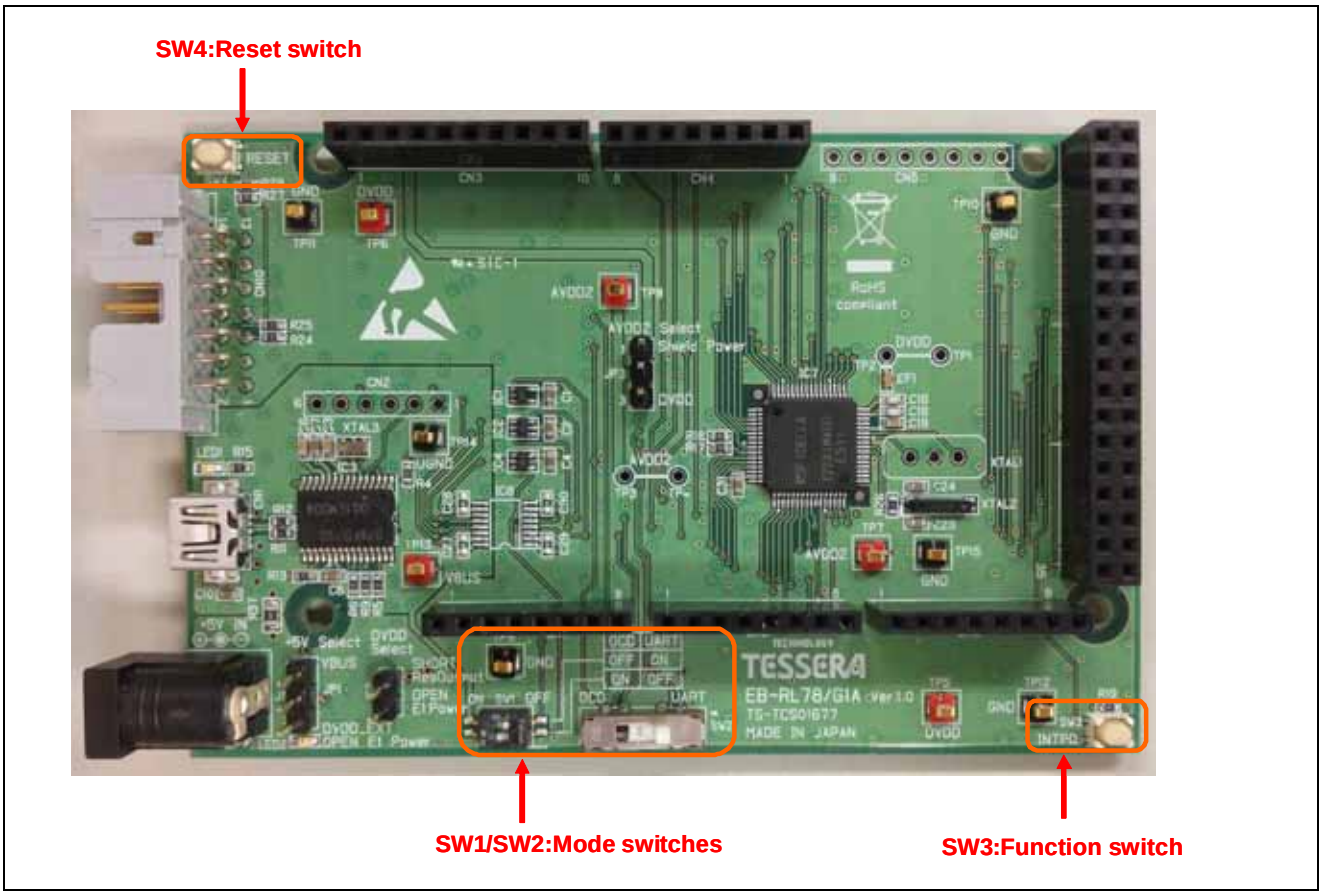


Figure 2.7 Switch Positions

2.4.3.2 Clock

The on-board MCU (RL78/G1A) on the TSA board has a built-in high-speed on-chip oscillator that serves as the system clock. As use of the built-in high-speed oscillator circuit is expected, the board does not offer a mounted resonator as the default. However, the board includes patterns (XTAL1) for adding a resonator when needed to meet higher frequency or frequency precision requirements. The patterns can accommodate a lead-type 2- or 3-terminal resonator. The board also includes an XTAL2 (32.768 kHz) resonator as the sub-clock.

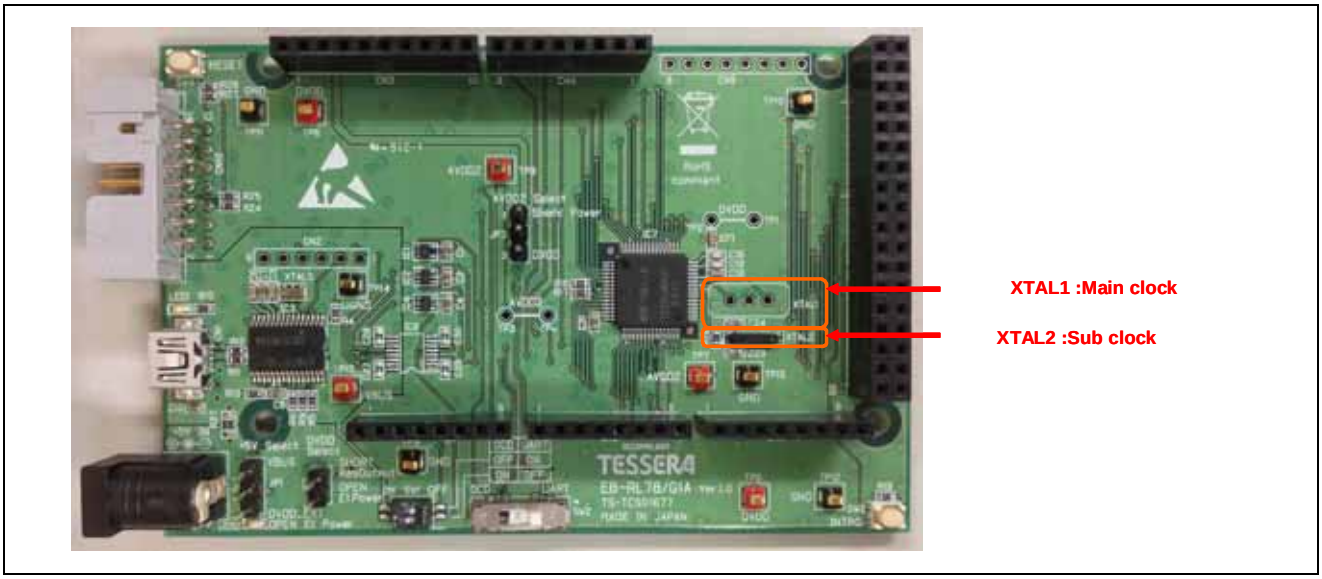


Figure 2.8 Clock Positions

2.4.3.3 Current Consumption Measurement Terminals

The TSA board is designed with measurement terminals for measuring the current consumption of the mounted device (CPU/Smart Analog IC). Before taking measurements, remove the 0Ω resistor.

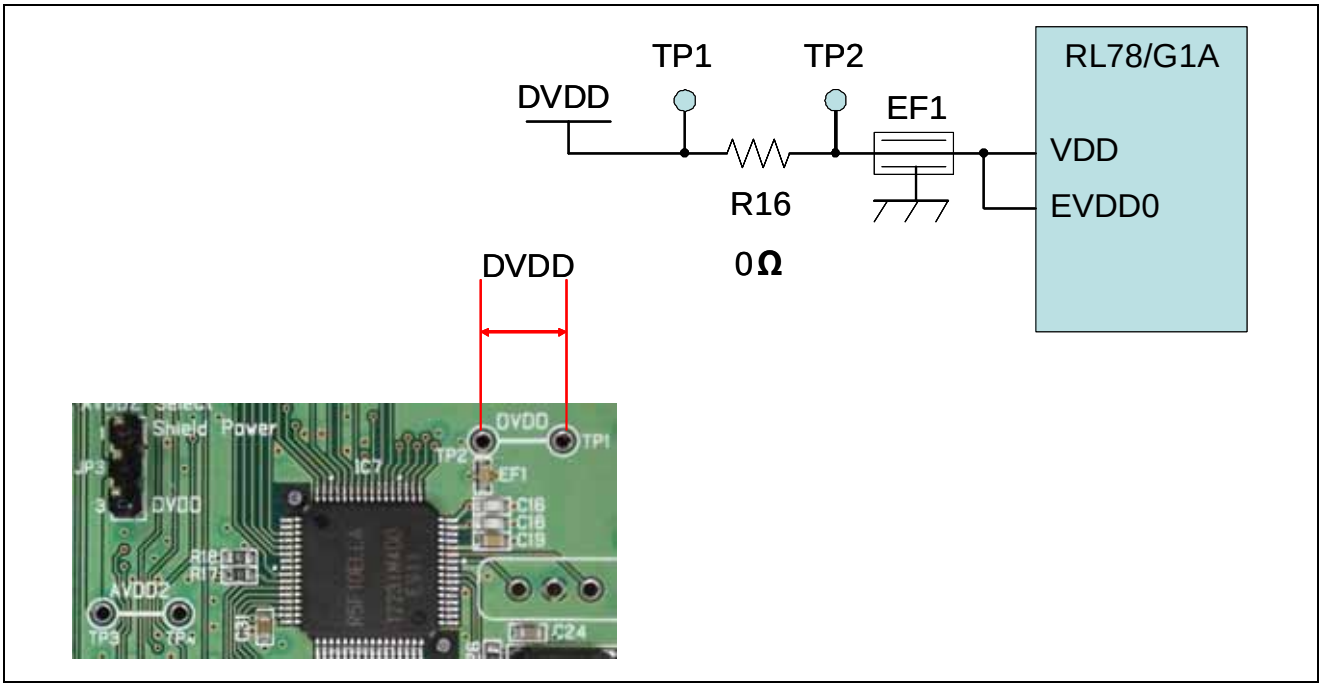


Figure 2.9 EB-RL78/G1A CPU Current Measurement Terminals (DVDD)

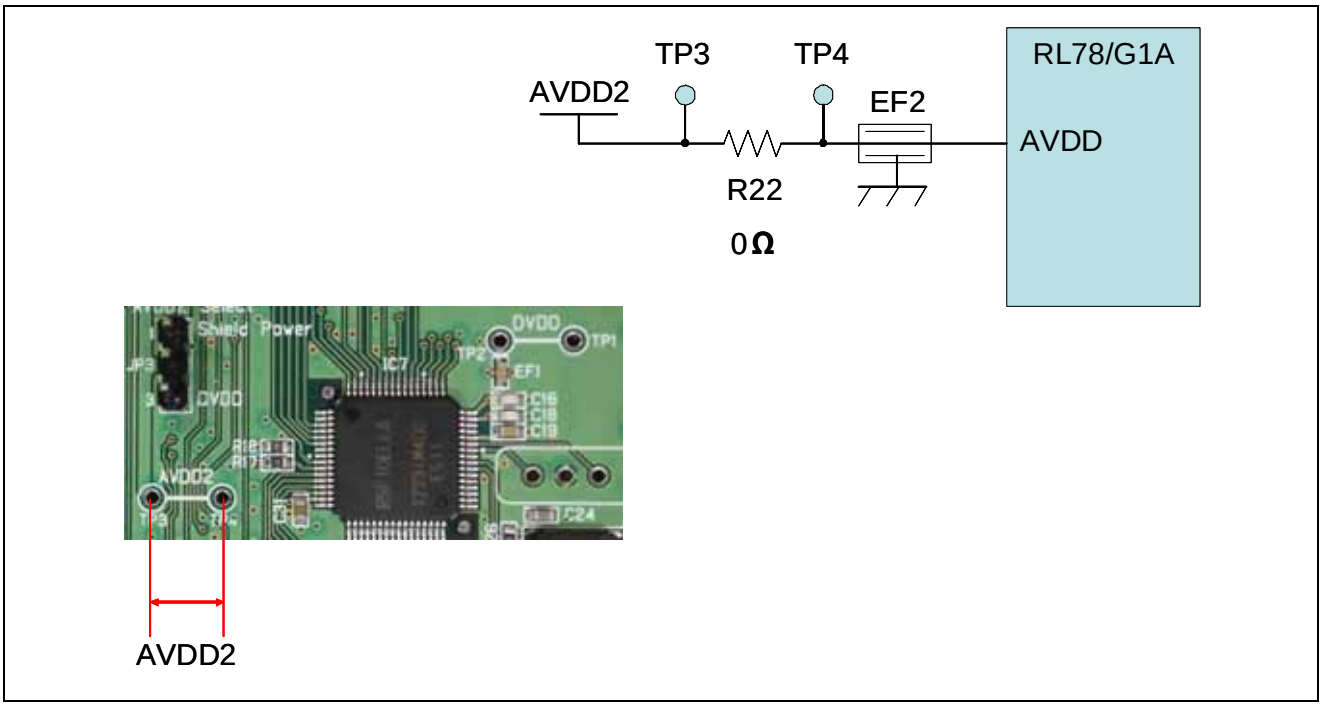


Figure 2.10 EB-RL78/G1A Current Measurement Terminals (AVDD2)

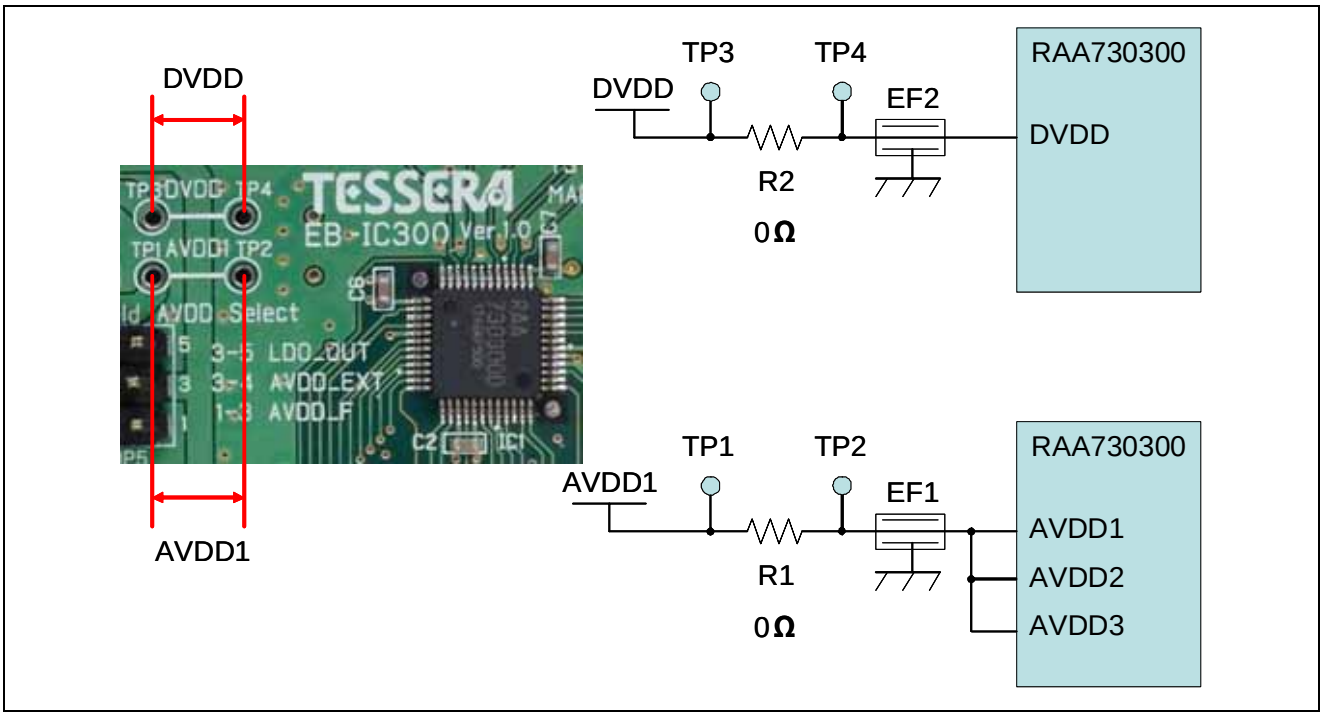


Figure 2.11 EB-IC300 Current Measurement Terminals (DVDD/AVDD1)

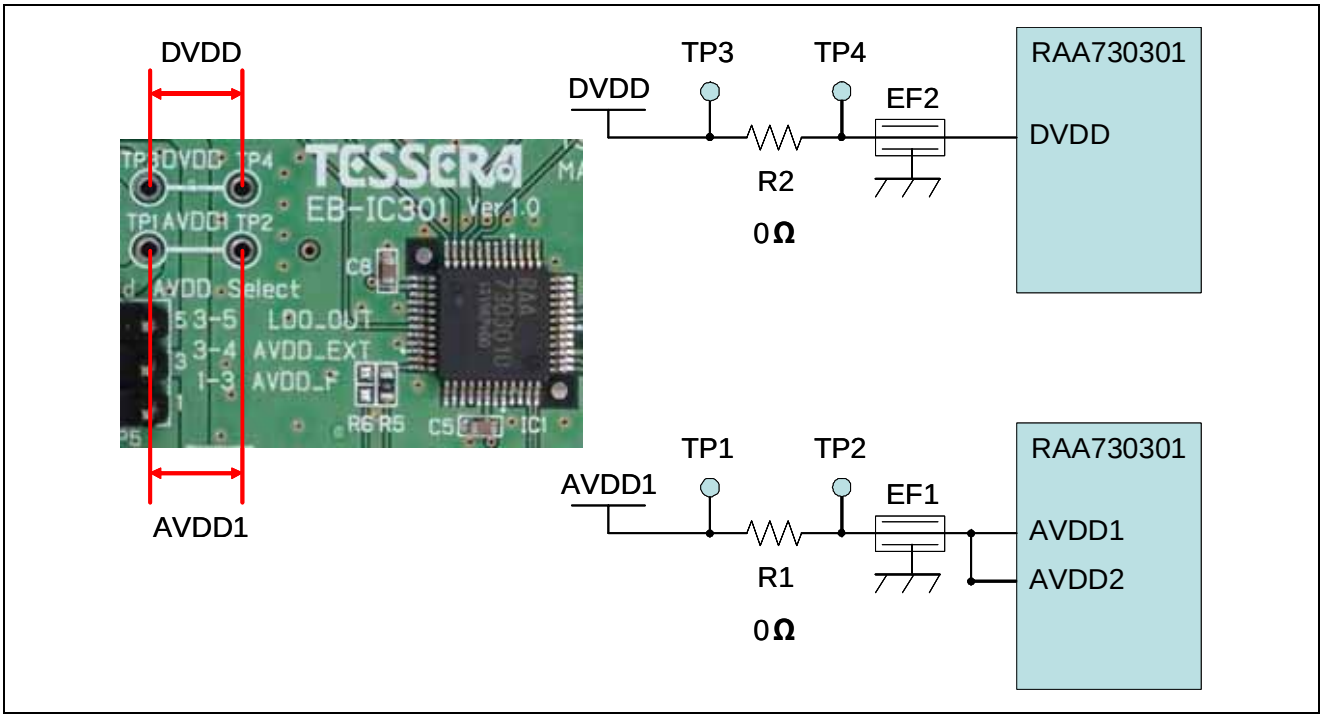


Figure 2.12 EB-IC301 Current Measurement Terminals (DVDD/AVDD1)

2.4.3.4 Universal Area

EB-IC30x includes a universal area for expansion use. The design includes analog power AVDD1 and GND pin holes, making modifications quick and easy.

Figure 2.13 EB-IC30x Universal Area

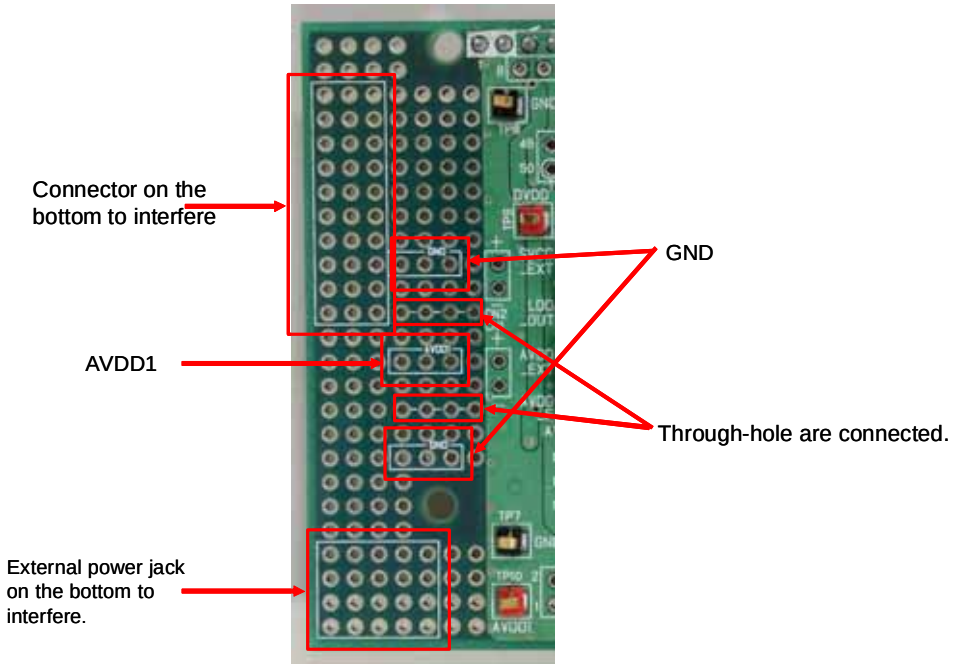


Figure 2.14 Universal Area Expansion

2.4.3.5 Smart Analog IC

The following table shows where SA-IC pins are connected.

Table 2.10 EB-IC300 Smart Analog IC300 Pin Connections

Smart Analog IC300 Pin No.	Smart Analog IC300 Pin name	Singnal name	EB-IC300 Connection destination	RL78/G1A	
				Pin No.	name
1	AVDD3	AVDD1	Analog power	-	-
2	SC_IN	SC_IN	Sensor extension I/F connector(TH2)	-	-
3	TEST	-	GND	-	-
4	AMP5_OUT	AMP5_OUT	Sensor extension I/F connector(TH2)	-	-
5	AGND2	GND	GND	-	-
6	AMP5_INN	AMP5_INN	Sensor extension I/F connector(TH2)	-	-
7	AMP5_INP	AMP5_INP	Sensor extension I/F connector(TH2)	-	-
8	MPXIN61	MPXIN61	Sensor extension I/F connector(TH2)	-	-
9	MPXIN51	MPXIN51	Sensor extension I/F connector(TH2)	-	-
10	MPXIN60	MPXIN60	Sensor extension I/F connector(TH2)	-	-
11	MPXIN50	MPXIN50	Sensor extension I/F connector(TH2)	-	-
12	AMP3_OUT	AMP3_OUT	Sensor extension I/F connector(TH2)	54	ANI2
13	DAC3_OUT/VREFIN3	DAC3_OUT	Sensor extension I/F connector(TH2)	-	-
14	AMP2_OUT	AMP2_OUT	Sensor extension I/F connector(TH2)	50	ANI6
15	AGND1	GND	GND	-	-
16	AMP1_OUT	AMP1_OUT	Sensor extension I/F connector(TH2)	49	ANI7
17	AVDD1	AVDD1	Analog power	-	-
18	DAC2_OUT/VREFIN2	DAC2_OUT	Sensor extension I/F connector(TH2)	-	-
19	DAC1_OUT/VREFIN1	DAC1_OUT	Sensor extension I/F connector(TH2)	-	-
20	MPXIN41	MPXIN41	Sensor extension I/F connector(TH2)	-	-
21	MPXIN31	MPXIN31	Sensor extension I/F connector(TH2)	-	-
22	MPXIN40	MPXIN40	Sensor extension I/F connector(TH2)	-	-
23	MPXIN30	MPXIN30	Sensor extension I/F connector(TH2)	-	-
24	MPXIN21	MPXIN21	Sensor extension I/F connector(TH2)	-	-
25	MPXIN11	MPXIN11	Sensor extension I/F connector(TH2)	-	-
26	MPXIN20	MPXIN20	Sensor extension I/F connector(TH2)	-	-
27	MPXIN10	MPXIN10	Sensor extension I/F connector(TH2)	-	-
28	AGND3	GND	GND	-	-
29	I.C	-	GND	-	-
30	AVDD2	AVDD1	Analog power	-	-
31	LDO_OUT	LDO_OUT	Sensor extension I/F connector(TH2)	-	-
32	AMP4_OUT	AMP4_OUT	Sensor extension I/F connector(TH2)	51	ANI5
33	AMP4_INN	AMP4_INN	Sensor extension I/F connector(TH2)	-	-
34	AMP4_INP	AMP4_INP	Sensor extension I/F connector(TH2)	-	-
35	TEMP_OUT	TEMP_OUT	Sensor extension I/F connector(TH2)	60	ANI17
36	/RESET	RESET_B	MCU extension I/F connector(TH1)	57	P130
37	DVDD	DVDD	Digital power	-	-
38	/SCLK	SCLK_B	MCU extension I/F connector(TH1)	29	SCK21
39	SDO	SDO	MCU extension I/F connector(TH1)	28	SI21
40	SDI	SDI	MCU extension I/F connector(TH1)	27	SO21
41	/CS	CS_B	MCU extension I/F connector(TH1)	26	P73
42	DGND	GND	GND	-	-
43	DAC4_OUT/VREFIN4	DAC4_OUT	Sensor extension I/F connector(TH2)	-	-
44	HPF_OUT	HPF_OUT	Sensor extension I/F connector(TH2)	52	ANI4
45	CLK_HPF	CLK_HPF	MCU extension I/F connector(TH1)	61	P01
46	CLK_LPF	CLK_LPF	MCU extension I/F connector(TH1)	3	P42
47	AGND4	GND	GND	-	-
48	LPF_OUT	LPF_OUT	Sensor extension I/F connector(TH2)	53	ANI3

Table 2.11 EB-IC301 Smart Analog IC301 Pin Connections

Smart Analog IC301 Pin No.	Smart Analog IC301 Pin name	Singnal name	EB-IC301 Connection destination	RL78/G1A	
				Pin No.	name
1	DGND	GND	GND	-	-
2	DVDD	DVDD	Digital power	-	-
3	TEST2	-	OPEN	-	-
4	TEST1	-	GND	-	-
5	TEST1	-	GND	-	-
6	DGND	GND	GND	-	-
7	/RESET	RESET_B	MCU extension I/F connector(TH1)	57	P130
8	AGND2	GND	GND	-	-
9	AGND2	GND	GND	-	-
10	AGND2	GND	GND	-	-
11	AGND2	GND	GND	-	-
12	TEMP_OUT	TEMP_OUT	Sensor extension I/F connector(TH2)	60	ANI17
13	I.C	-	GND	-	-
14	AGND2	GND	GND	-	-
15	AGND2	GND	GND	-	-
16	LDO_OUT	LDO_OUT	Sensor extension I/F connector(TH2)		
17	AGND2	GND	GND	-	-
18	AVDD2	AVDD1	Analog power	-	-
19	AGND1	GND	GND	-	-
20	AGND1	GND	GND	-	-
21	AMPINP0	AMPINP0	Sensor extension I/F connector(TH2)	-	-
22	AMPINM0	AMPINM0	Sensor extension I/F connector(TH2)	-	-
23	AMPINP1	AMPINP1	Sensor extension I/F connector(TH2)	-	-
24	AMPINM1	AMPINM1	Sensor extension I/F connector(TH2)	-	-
25	AMPINP2	AMPINP2	Sensor extension I/F connector(TH2)	-	-
26	AMPINM2	AMPINM2	Sensor extension I/F connector(TH2)	-	-
27	AGND1	GND	GND	-	-
28	AGND1	GND	GND	-	-
29	AGND1	GND	GND	-	-
30	AVDD1	AVDD1	Analog power	-	-
31	AMP_OUT	AMP_OUT	Sensor extension I/F connector(TH2)	49	ANI7
32	DAC_OUT/VREFIN	DAC_OUT	Sensor extension I/F connector(TH2)	-	-
33	TEST2	-	OPEN	-	-
34	TEST2	-	OPEN	-	-
35	TEST2	-	OPEN	-	-
36	TEST2	-	OPEN	-	-
37	AGND1	GND	GND	-	-
38	AGND1	GND	GND	-	-
39	AGND1	GND	GND	-	-
40	AGND1	GND	GND	-	-
41	AGND1	GND	GND	-	-
42	AGND1	GND	GND	-	-
43	DGND	GND	GND	-	-
44	DGND	GND	GND	-	-
45	/SCLK	SCLK_B	MCU extension I/F connector(TH1)	29	SCK21
46	SDO	SDO	MCU extension I/F connector(TH1)	28	SI21
47	SDI	SDI	MCU extension I/F connector(TH1)	27	SO21
48	/CS	CS_B	MCU extension I/F connector(TH1)	26	P73

2.4.4 Connectors

The TSA board provides various types of connectors. Table 2.12 lists the connectors and the corresponding functions (some connectors may not be mounted on the board).

Table 2.12 Connector Functions

Connector Reference	Type	Connector Product Number	Functions
J1	DC power jack	HEC0470-01-630	External power supply (+5.0V input) Center pin (positive) is 5V and surrounding is GND. Input voltage requirement: Min. 4.0V to Max. 5.5V
CN2	USB Mini-B connector	UX60SC-MB-5ST	USB I/F
CN10	2.54mm pitch 14-pin connector	7614-5002PL	E1 Emulator I/F
TH1	2.54mm pitch 10-pin connector	Not mounted	MCU extension I/F
TH2	2.54mm pitch 50-pin connector	Not mounted	Sensor extension I/F

2.4.4.1 External Power Supply Connector

Connector J1 is installed as an external power-supply connector. Please use a suitable AC adaptor. Refer to "2.4.1 Power Supply" for details concerning external, USB and E1 power feeds.

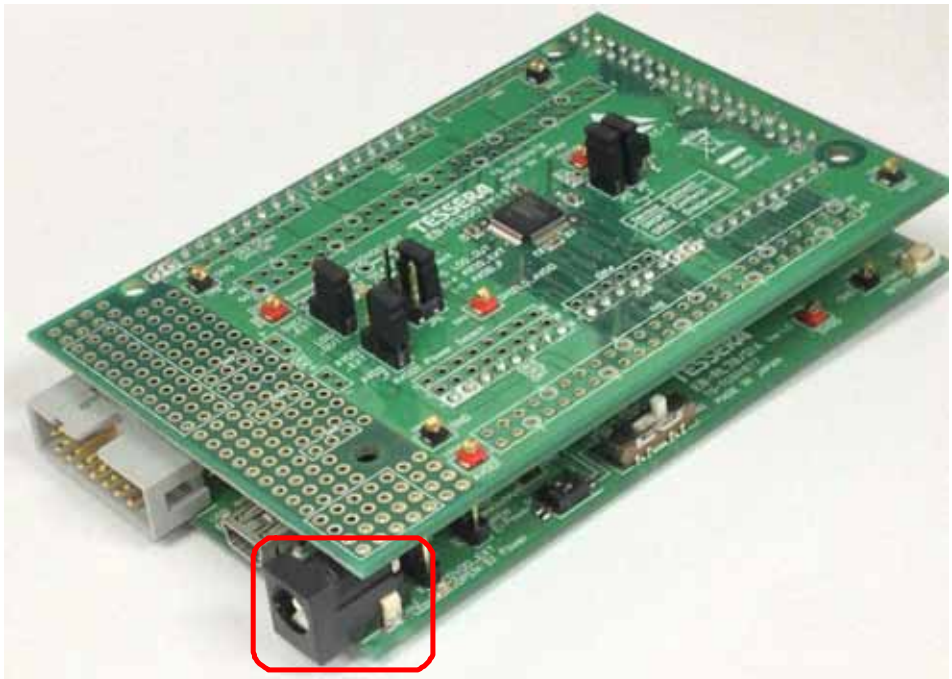


Figure 2.15 External Power Supply Connector Position

2.4.4.2 USB I/F Connector

Connector CN2 is provided as the USB I/F connector on the TSA board. RL78/G1A is connected to the PC through the USB controller (78K0 μPD78F0730MC-CAB-AX). A USB cable is bundled with the board for this purpose. This connection to the PC enables the developer to debug and flash-program the CPU (RL78/G1A) firmware with CubeSuite+ and RFP, respectively. For more details on debugging with CubeSuite+, see **4. Using CubeSuite+ to Debug**. For details on using RFP to write to the CPU, refer to **5. Using Renesas Flash Programmer to Program the CPU**.

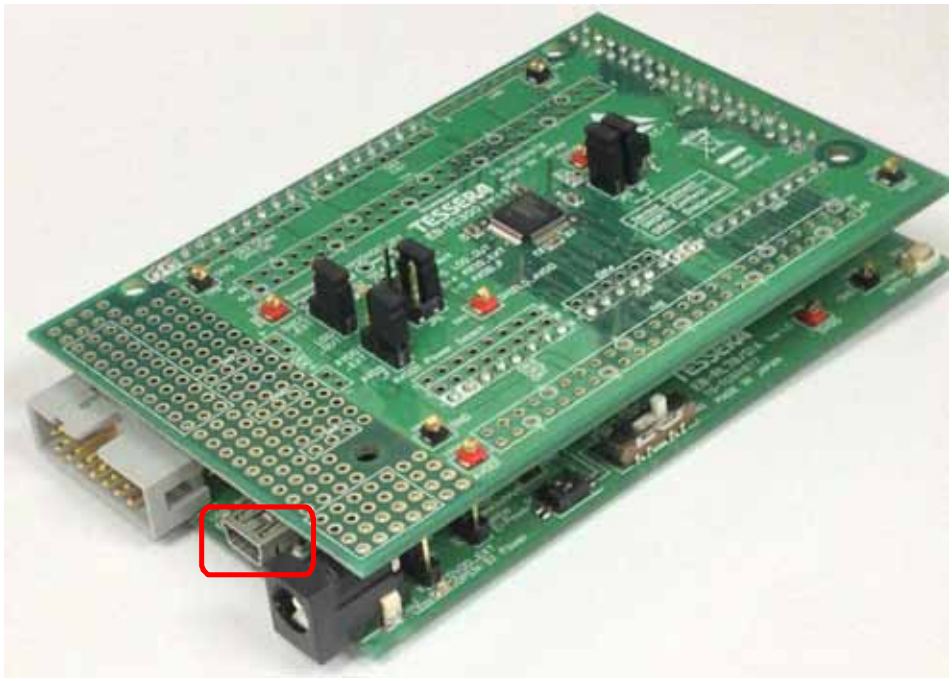


Figure 2.16 USB I/F Connector Position

2.4.4.3 E1 Emulator I/F Connector

Connector CN10 serves as the E1 Emulator I/F connector for the TSA board. This E1 Emulation connection enables the developer to debug with CubeSuite+ and flash-program the CPU (RL78/G1A) firmware with CubeSuite+ and RFP, respectively. For more details on debugging with CubeSuite+, see **4. Using CubeSuite+ to Debug**. For details on using RFP to write to the CPU, refer to **5. Using Renesas Flash Programmer to Program the CPU**.

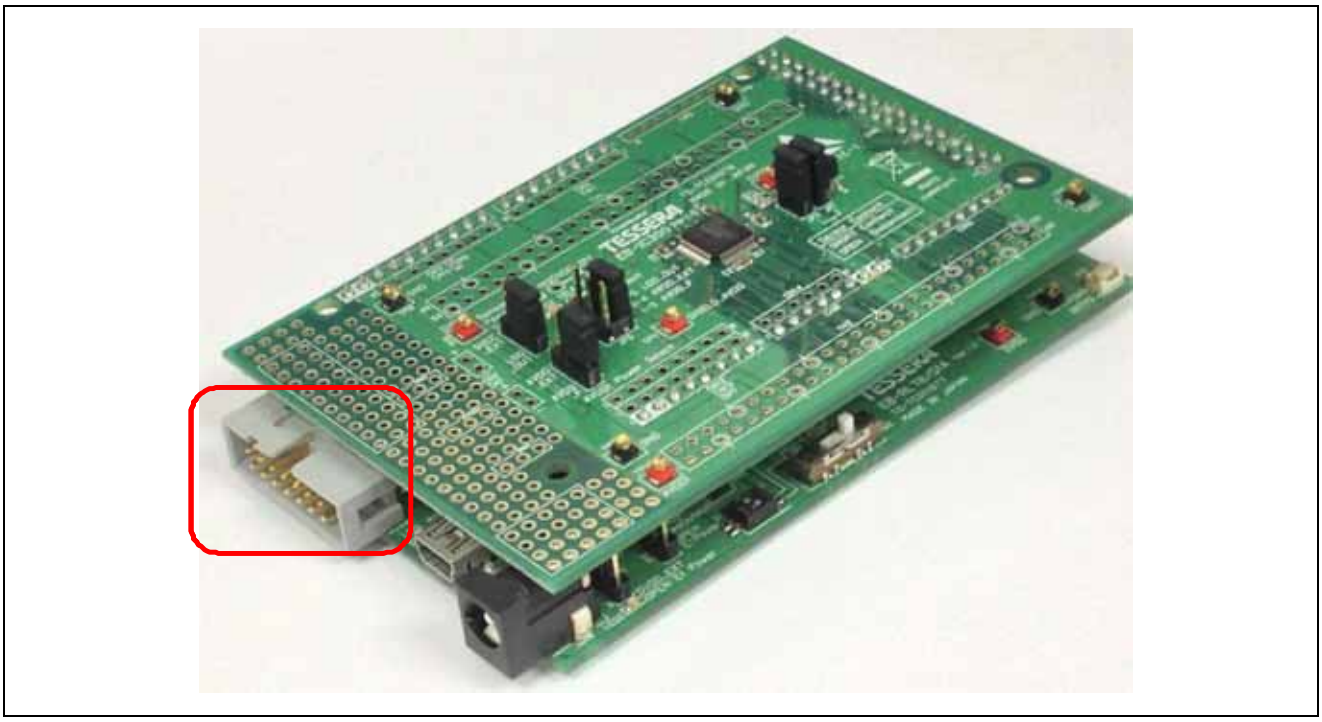


Figure 2.17 E1 Emulator I/F Connector Position

2.4.4.4 EB-RL78/G1A-EB-IC30x Connectors

The TSA board provides connectors CN3-4 and CN6-CN9 for the connection between EB-RL78G1A and EB-IC30x.

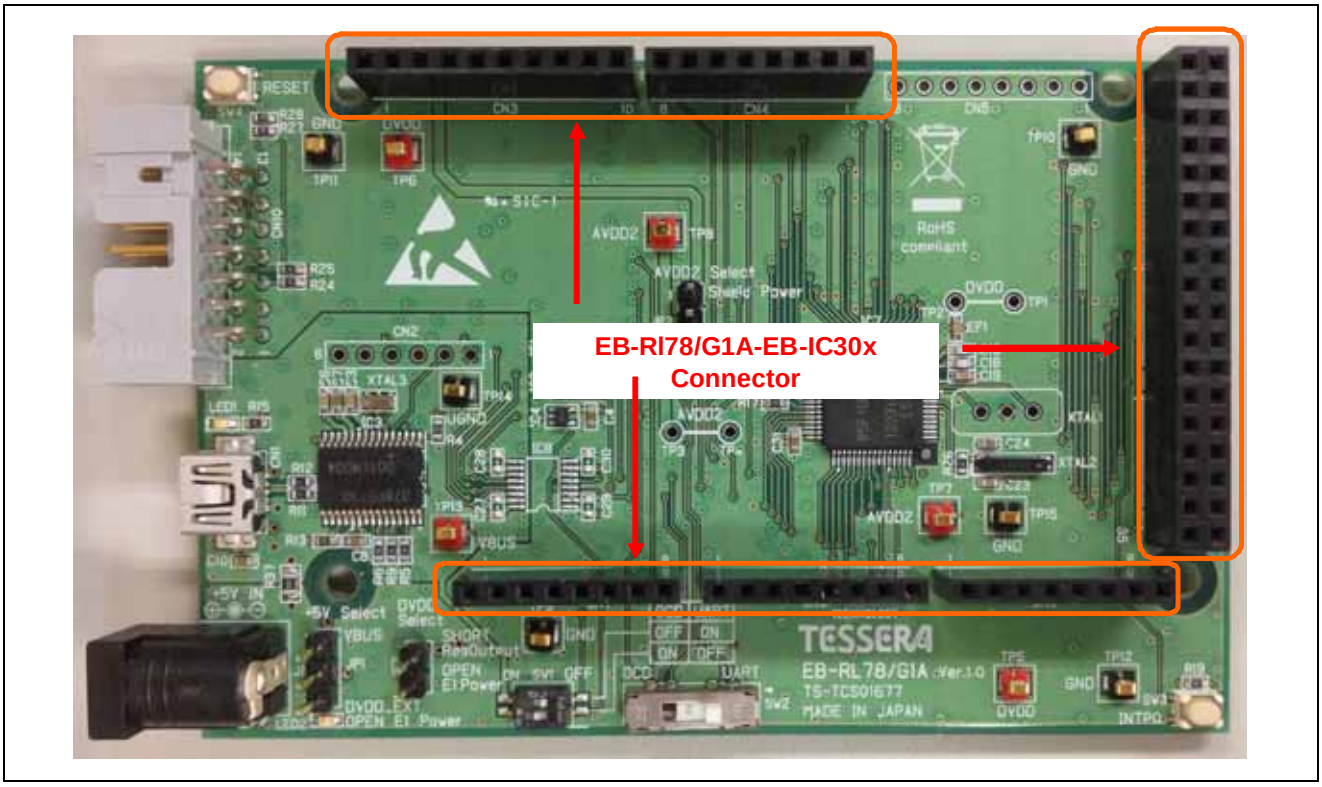


Figure 2.18 EB-IC30x Connector Positions on EB-RL78/G1A

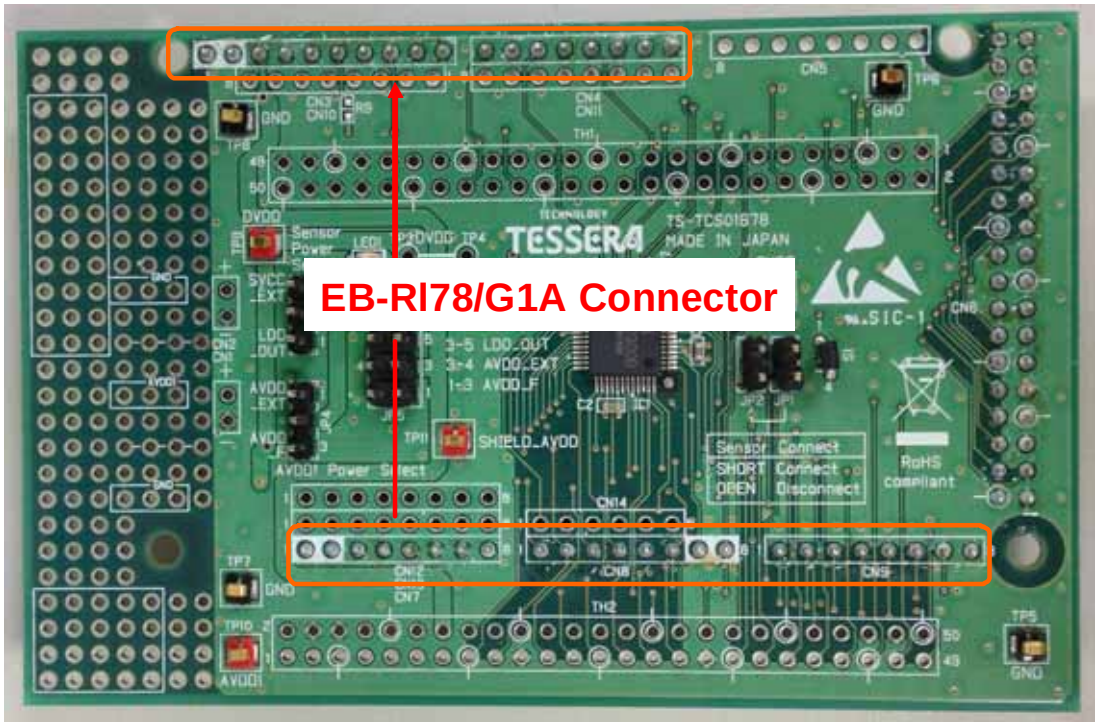


Figure 2.19 RL78/G1A Connector Positions on EB-IC300

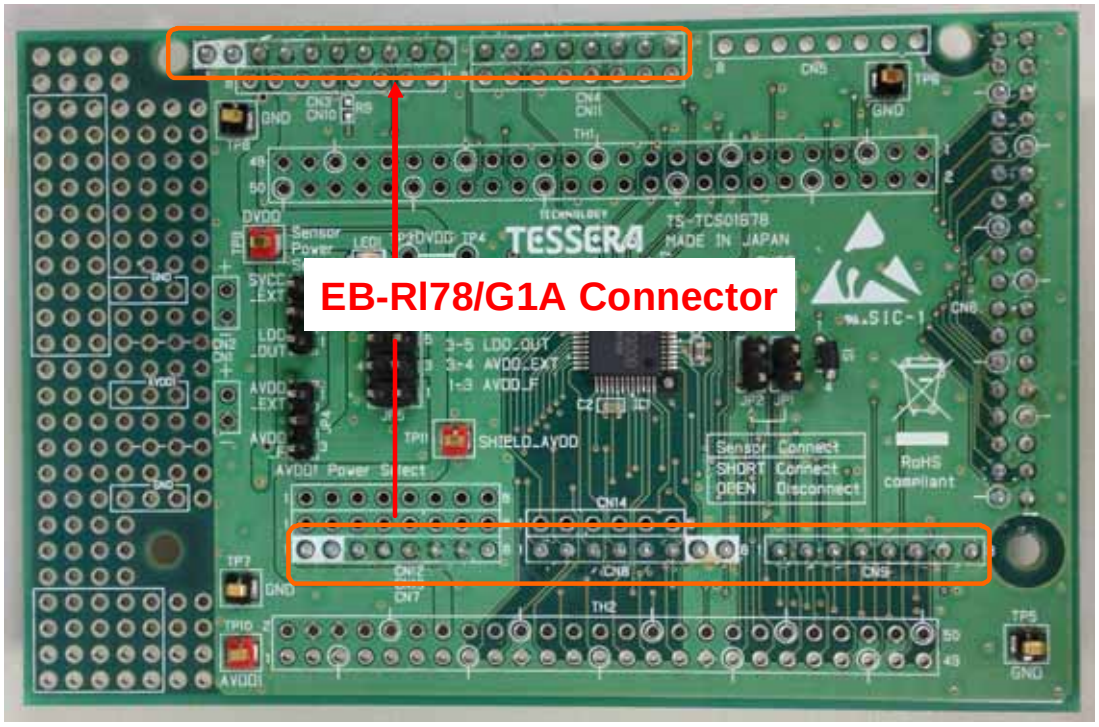


Figure 2.20 RL78/G1A Connector Positions on EB-IC301

2.4.4.5 Sensor Extension I/F Connector

Connector TH2 is designed on EB-IC30X for adding an external sensor board. Note that no components are mounted at shipment. The through-holes are provided for the developer to use as needed.

Table 2.13 EB-IC300 Sensor Extension I/F Connector

TH2	Smart Analog IC300		Signal name of the schematic	TH2	Smart Analog IC300		Signal name of the schematic
Pin No.	Pin No.	Pin name		Pin No.	Pin No.	Pin name	
1	19	DAC1_OUT/VREFIN1	DAC1_OUT	2	-	-	AVDD1
3	16	AMP1_OUT	AMP1_OUT	4	-	-	GND
5	-	-	GND	6	-	-	GND
7	27	MPXIN10	MPXIN10	8	-	-	-
9	25	MPXIN11	MPXIN11	10	-	-	-
11	26	MPXIN20	MPXIN20	12	-	-	-
13	24	MPXIN21	MPXIN21	14	-	-	SHIELD_AVDD
15	18	DAC2_OUT/VREFIN2	DAC2_OUT	16	-	-	RL78_AVREFP
17	14	AMP2_OUT	AMP2_OUT	18	-	-	RL78_AVREFM
19	-	-	GND	20	-	-	RL78_ANI8
21	23	MPXIN30	MPXIN30	22	-	-	RL78_ANI9
23	21	MPXIN31	MPXIN31	24	-	-	RL78_ANI10
25	22	MPXIN40	MPXIN40	26	-	-	RL78_ANI11
27	20	MPXIN41	MPXIN41	28	-	-	RL78_ANI12
29	13	DAC3_OUT/VREFIN3	DAC3_OUT	30	35	TEMP_OUT	TEMP_OUT
31	12	AMP3_OUT	AMP3_OUT	32	44	HPF_OUT	HPF_OUT
33	-	-	GND	34	48	LPF_OUT	LPF_OUT
35	11	MPXIN50	MPXIN50	36	7	AMP5_INP	AMP5_INP
37	9	MPXIN51	MPXIN51	38	4	AMP5_OUT	AMP5_OUT
39	10	MPXIN60	MPXIN60	40	2	SC_IN	SC_IN
41	8	MPXIN61	MPXIN61	42	6	AMP5_INN	AMP5_INN
43	33	AMP4_INN	AMP4_INN	44	31	LDO_OUT	LDO_OUT
45	34	AMP4_INP	AMP4_INP	46	-	-	GND
47	43	DAC4_OUT/VREFIN4	DAC4_OUT	48	-	-	GND
49	32	AMP4_OUT	AMP4_OUT	50	-	-	AVDD1

Table 2.14 EB-IC301 Sensor Extension I/F Connector

TH2	Smart Analog IC301		Signal name of the schematic	TH2	Smart Analog IC301		Signal name of the schematic
Pin No.	Pin No.	Pin name		Pin No.	Pin No.	Pin name	
1	-	-	-	2	-	-	AVDD1
3	-	-	-	4	-	-	GND
5	-	-	GND	6	-	-	GND
7	-	-	-	8	-	-	-
9	-	-	-	10	-	-	-
11	22	AMPINM0	AMPINM0	12	-	-	-
13	24	AMPINM1	AMPINM1	14	-	-	SHIELD_AVDD
15	-	-	-	16	-	-	RL78_AVREFP
17	-	-	-	18	-	-	RL78_AVREFM
19			GND	20	-	-	RL78_ANI8
21	-	-	-	22	-	-	RL78_ANI9
23	-	-	-	24	-	-	RL78_ANI10
25	21	AMPINP0	AMPINP0	26	-	-	RL78_ANI11
27	23	AMPINP1	AMPINP1	28	-	-	RL78_ANI12
29	32	DAC_OUT/VREFIN	DAC_OUT	30	12	TEMP_OUT	TEMP_OUT
31	31	AMP_OUT	AMP_OUT	32	-	-	-
33	-	-	GND	34	-	-	-
35	-	-	-	36	-	-	-
37	-	-	-	38	-	-	-
39	-	-	-	40	-	-	-
41	-	-	-	42	-	-	-
43	26	AMPINM2	AMPINM2	44	16	LDO_OUT	LDO_OUT
45	25	AMPINP2	AMPINP2	46	-	-	GND
47	-	-	-	48	-	-	GND
49	-	-	-	50	-	-	AVDD1

Tessera also offers a sensor extension board (TSA-EXT Board) which can be connected to the sensor extension I/F connector TH2. The TSA-EXT Board is equipped a 50-pin pin header so that (TSA-EXT Board can be easily inserted. The pin header should be mounted to TH2, on the same side of the board as the Smart Analog IC. As shown in Figure 2.12, combined use of TSA-IC30x and the extension board enables the developer to add new sensors.

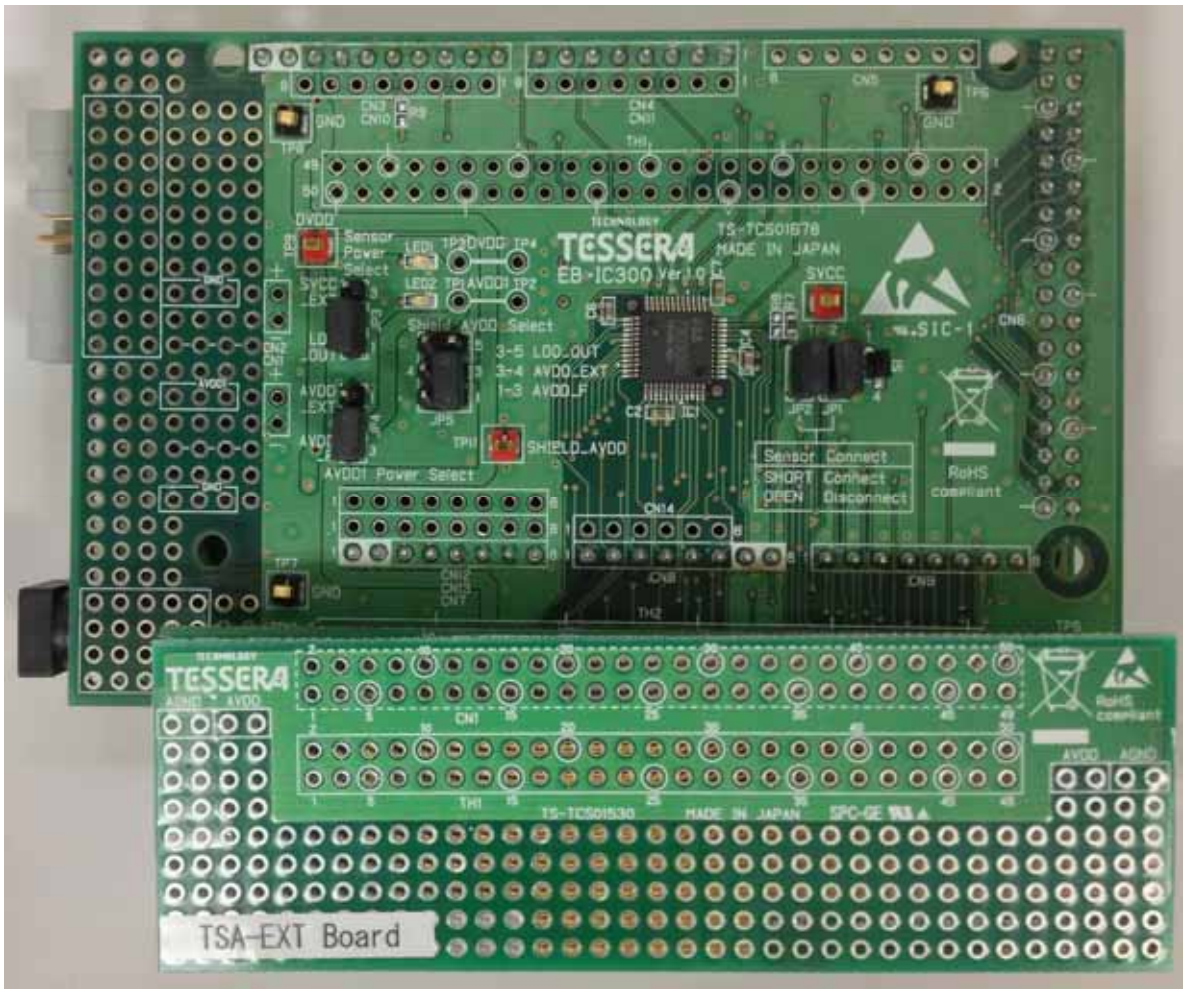


Figure 2.21 Sensor Extension Board TSA-EXT BOARD Connected to TSA-IC300

* TSA-EXT Board is sold separately and is not included with TSA-IC300 or TSA-IC301.

2.4.4.6 MCU Extension I/F Connector

The EB-IC30x board is equipped with connector TH1, which serves as the MCU extension I/F connector. Note that no components are mounted to TH1 at shipment. The through-holes are provided for the developer to use as needed.

Table 2.15 EB-IC300 MCU Extension I/F Connector

TH1	RL78/G1A		Signal name of the svhematic	TH1	RL78/G1A		Signal name of the svhematic
Pin No.	Pin No.	Pin name		Pin No.	Pin No.	Pin name	
1	-		GND	2	-		GND
3	23	P76	RL78_P76	4	22	P77	RL78_P77
5	28	P71	SDO	6	27	P72	SDI
7	32	P30	RL78_P30	8	29	P70	SCLK_B
9	58	P04	RL78_P04	10	-		-
11	2	P43	RL78_P43	12	3	P42	CLK_LPF
13	35	P16	RL78_P16	14	36	P15	RL78_P15
15	37	P14	RL78_P14	16	38	P13	RL78_P13
17	-		-	18	-		-
19	41	P10	RL78_SCK00	20	-		-
21	61	P01	CLK_HPF	22	62	P00	RL78_P00
23	63	P141	RL78_P141	24	64	P140	RL78_P140
25	-		DVDD	26	-		DVDD
27	6	RESET	RL78_/RESET	28	9	P137	RL78_INTP0
29	21	P31	RL78_P31	30	24	P75	RL78_P75
31	25	P74	RL78_P74	32	26	P73	CS_B
33	4	P41	RL78_P41	34	30	P06	RL78_P06
35	31	P05	RL78_P05	36	57	P130	RESET_B
37	17	P60	RL78_P60	38	18	P61	RL78_P61
39	19	P62	RL78_P62	40	20	P63	RL78_P63
41	33	P50	RL78_INTP1	42	34	P51	RL78_INTP2
43	-		GND	44	-		GND
45	-		GND	46	-		GND
47	-		GND	48	-		GND
49	-		GND	50	-		GND

Table 2.16 EB-IC301 MCU Extension I/F Connector

TH1	RL78/G1A		Signal name of the svhematic	TH1	RL78/G1A		Signal name of the svhematic
Pin No.	Pin No.	Pin name		Pin No.	Pin No.	Pin name	
1	-		GND	2	-		GND
3	23	P76	RL78_P76	4	22	P77	RL78_P77
5	28	P71	SDO	6	27	P72	SDI
7	32	P30	RL78_P30	8	29	P70	SCLK_B
9	58	P04	RL78_P04	10	-		-
11	2	P43	RL78_P43	12	3	P42	RL78_P42
13	35	P16	RL78_P16	14	36	P15	RL78_P15
15	37	P14	RL78_P14	16	38	P13	RL78_P13
17	-		-	18	-		-
19	41	P10	RL78_SCK00	20	-		-
21	61	P01	RL78_P01	22	62	P00	RL78_P00
23	63	P141	RL78_P141	24	64	P140	RL78_P140
25	-		DVDD	26	-		DVDD
27	6	RESET	RL78_/RESET	28	9	P137	RL78_INTP0
29	21	P31	RL78_P31	30	24	P75	RL78_P75
31	25	P74	RL78_P74	32	26	P73	CS_B
33	4	P41	RL78_P41	34	30	P06	RL78_P06
35	31	P05	RL78_P05	36	57	P130	RESET_B
37	17	P60	RL78_P60	38	18	P61	RL78_P61
39	19	P62	RL78_P62	40	20	P63	RL78_P63
41	33	P50	RL78_INTP1	42	34	P51	RL78_INTP2
43	-		GND	44	-		GND
45	-		GND	46	-		GND
47	-		GND	48	-		GND
49	-		GND	50	-		GND

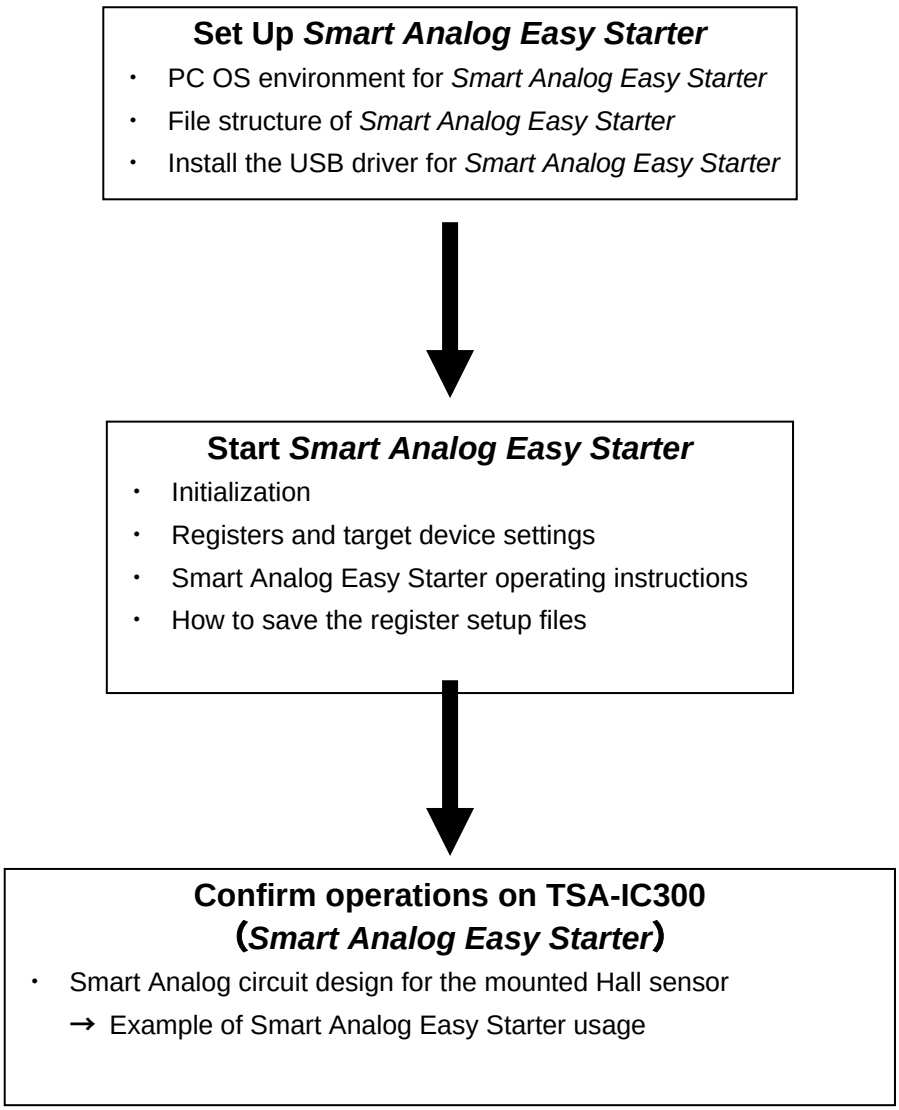
3. Confirmation of On-board Hall Sensor Operations

This section offers a tutorial for purchasers of the TSA evaluation board, providing instructions on how to easily evaluate an analog frontend circuit design. The mounted Hall sensor allows the developer to start the SA-IC evaluation without any additional resources after purchase. The tutorial uses TSA-IC300 as an example, but the same operations apply to TSA-IC301 evaluations as well.

3.1 Tutorial using *Smart Analog Easy Starter*

This tutorial is for using PC application software "Smart Analog Easy Starter." The firmware for the board to interface with the PC and the default firmware configuring SA-IC have already been written to TSA-IC300. The explanation is based on the use of Windows 7 and Smart Analog Easy Starter version 2.0. Please refer to the help section for more details on Smart Analog Easy Starter functions and operations.

Tutorial Flow



3.1.1 Set Up *Smart Analog Easy Starter*

3.1.1.1 PC OS environment for *Smart Analog Easy Starter*

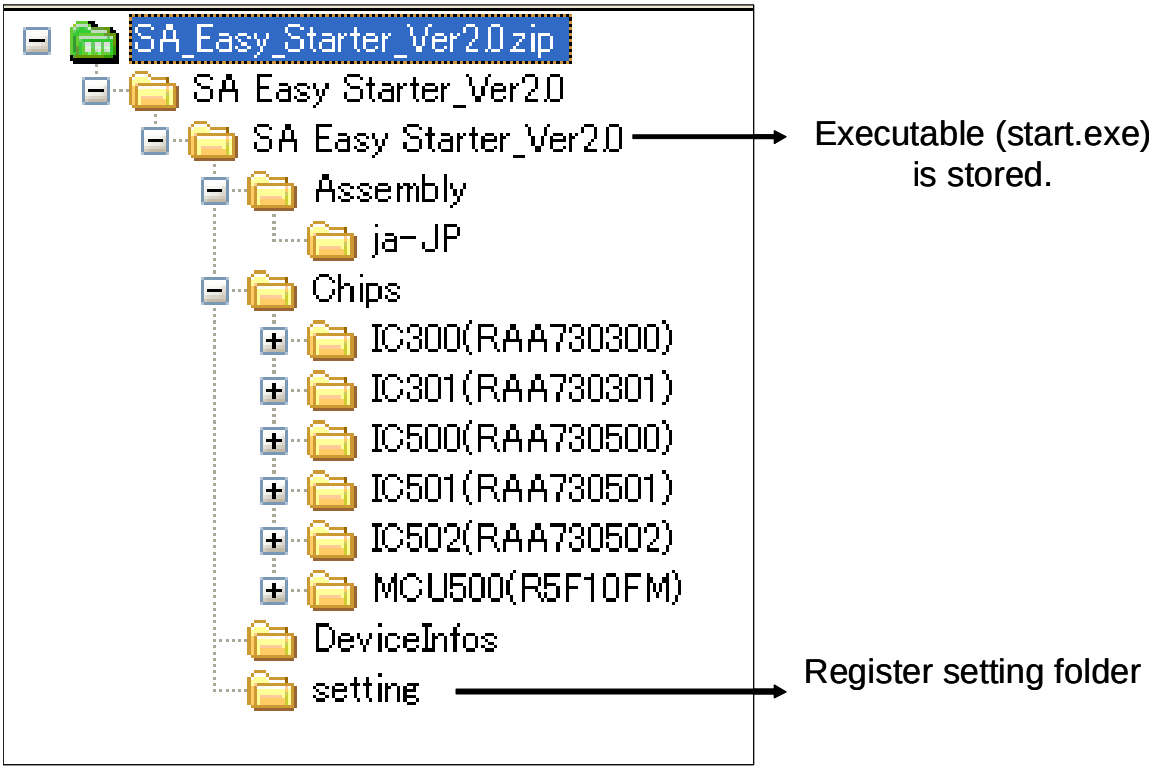
Smart Analog Easy Starter software can be save in any folder on your PC. The following operating systems are supported.

Supported OS

Windows 7 (32bit/64bit)
Windows Vista (32bit/64bit)
Windows XP (32bit)

3.1.1.2 File structure of *Smart Analog Easy Starter*

Smart Analog Easy Starter software can be saved in any folder in your system. Download the zip file from the URL indicated in the enclosed documents.
When you extract the downloaded Zip file, you should see the following files and directories (some files are omitted).



The Smart Analog IC30x setup files are also located under the *Smart Analog Easy Starter* directory. Please download this as well. After the setup file is download, store it in the register setting folder.

3.1.1.3 Install the USB driver for *Smart Analog Easy Starter*

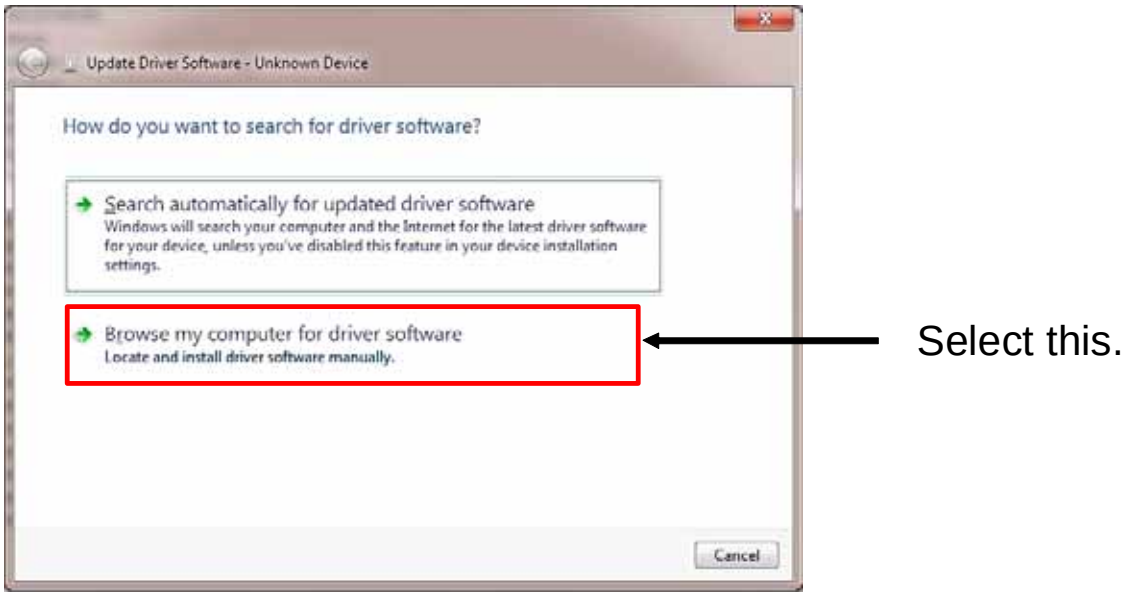
The following explains how to install the USB driver.

Cautionary notes concerning USB driver installation:

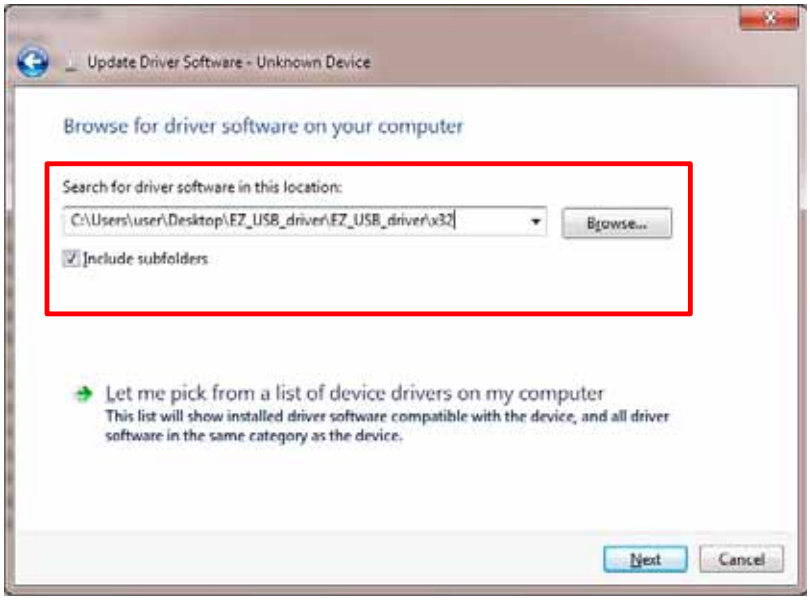
- Administrative privileges are required in order to install the USB driver.
- Connections via a USB hub may prevent your PC from recognizing the driver. If this occurs, connect the TSA board directly through a USB port on the PC, without using a USB hub.

The following steps describe how to install the USB driver:

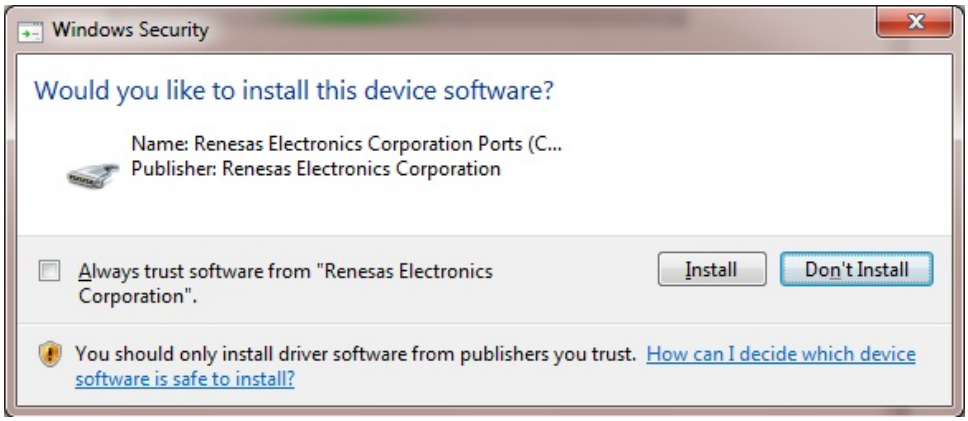
① Select the USB power feed and connect TSA-IC30x to the PC with a USB cable.
② When the PC and evaluation board are connected, the following update window is displayed. Select "Reference computer…"



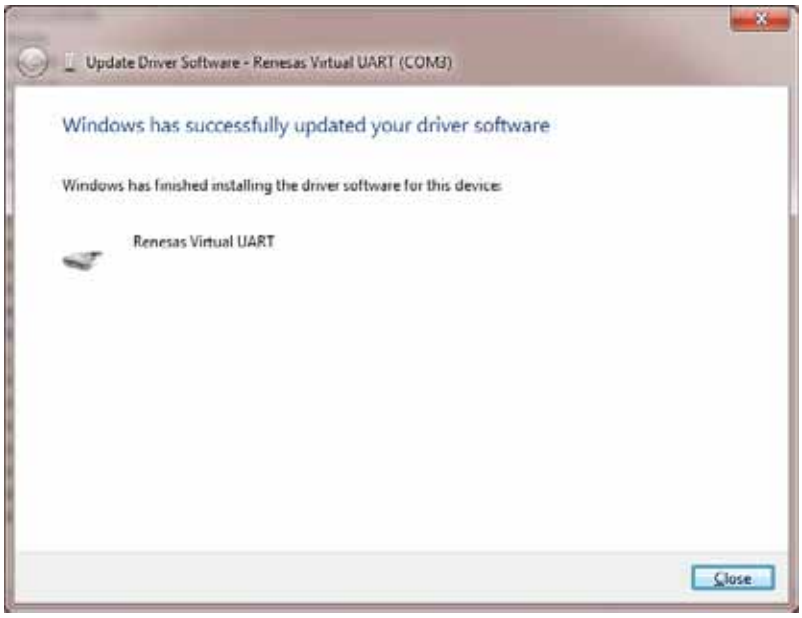
③ Specify the information file of the driver to be installed. Click "Browse", specify a folder to store MQB2SALL.inf and other files, and then click "Next".



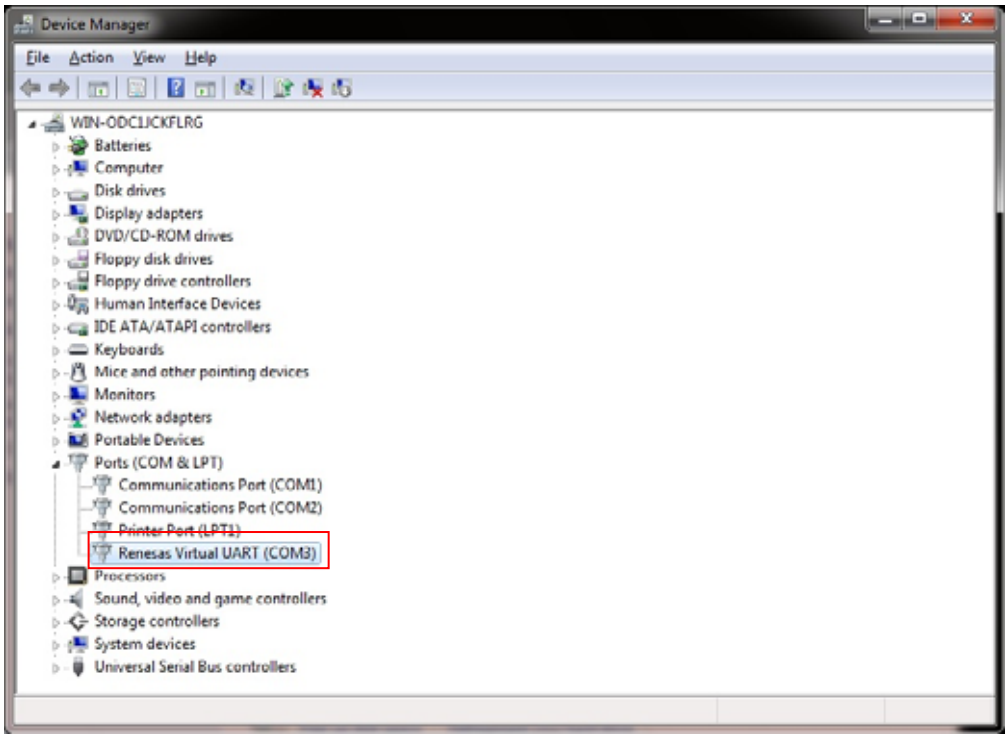
④ The driver installation will start. When the following window appears; click "Install" and continue with the installation process.



⑤ The following window appears when the installation completes successfully. Click "Close".



⑥ The following port is added to the device manager.



3.1.2 Start *Smart Analog Easy Starter*

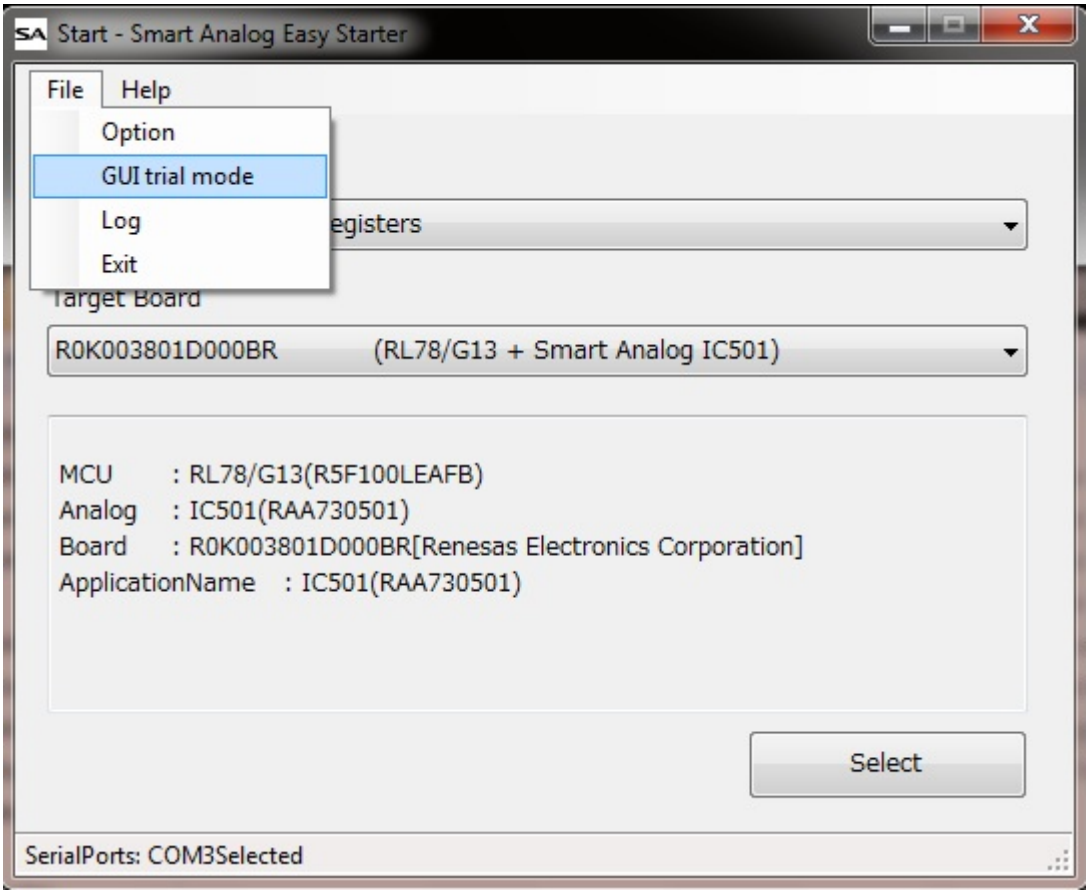
3.1.2.1 Initialization

To start the *Smart Analog Easy Starter* software, execute the "start.exe" file located in the folder where the software file was unzipped. The Start Window will appear on your screen. Click **File** in the Start Window and select **GUI Trial Mode**.

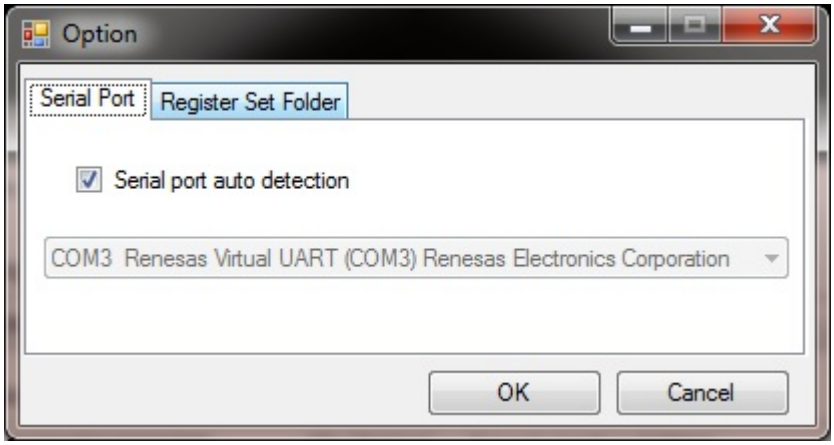
- **When initiating GUI after connecting to the board**
  Clear GUI Trial Mode (remove check from box).
- **When initiating GUI without connecting to board**
  Select GUI Trial Mode (add check to box).

Set the folder location for saving the register setup file in **Register Set Folder** under **Options**.
The ini file stored in **Register Set Folder** will then be loaded.

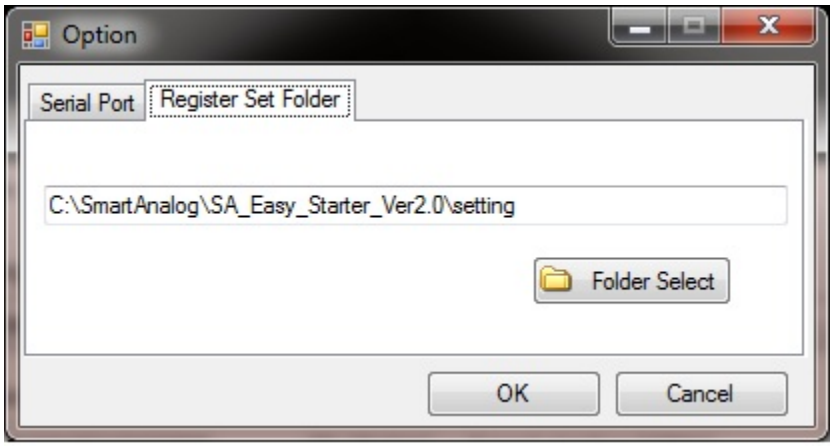
① When initiating GUI after connecting the board
Clear GUI Trial Mode (remove check from box).



② Option (serial port setting):
For most cases, select **Serial port auto detection**.



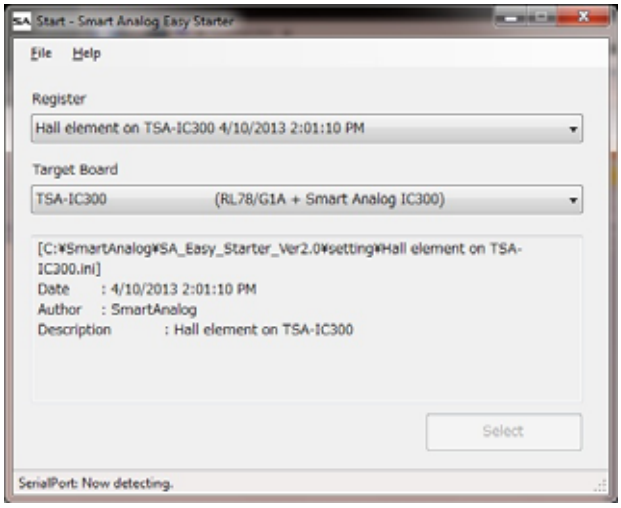
③ Option (register set folder setting):
For most cases, specify "(folder name) **¥setting"**.



3.1.2.2 Registers and target device settings

In the **Registers** box, select Hall element on TSA-IC300. To use the same values as the previous startup, select **Use the last status of Registers**. If the Register Setting File was saved during the previous startup, the characters input to the Register when the file was saved will be displayed; select accordingly. See **3.2.1.4 How to Save the Register setup files** for more details. In the Target Board box, select **TSA-IC300 (RL78/G1A+Smart Analog IC 300)**.

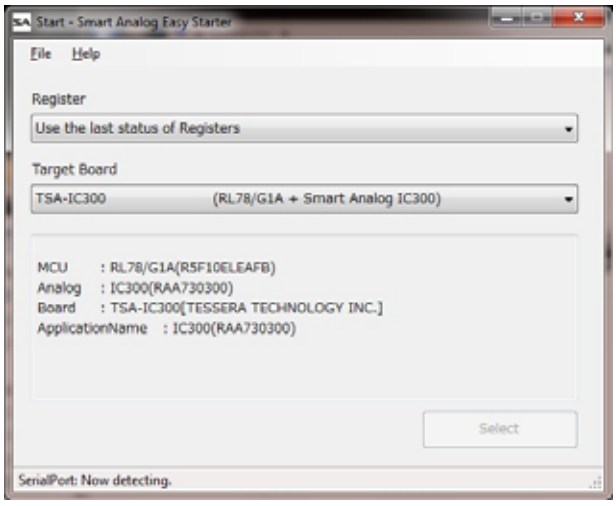
① Initial execution only:



For TSA-IC301, select the following.

Register	Hall element on TSA-IC301
Target board	TSA-IC301(RL78/G1A + Smart Analog IC301)

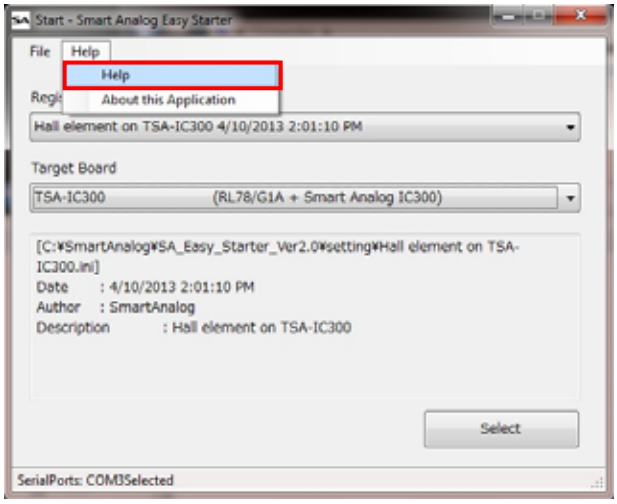
② Second and subsequent executions (to continue with previously set values):



3.1.2.3 *Smart Analog Easy Starter* operating instructions

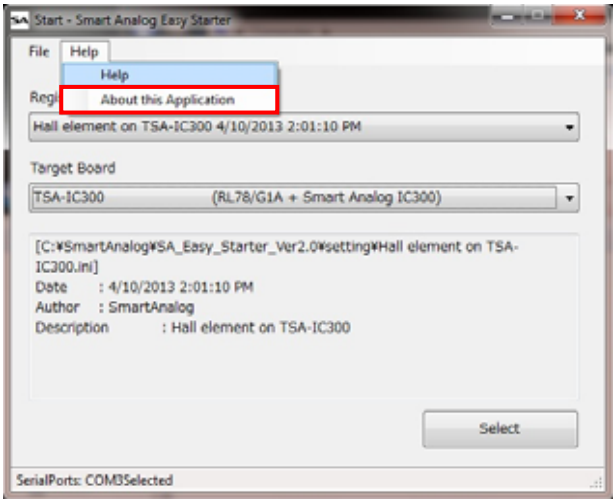
For detailed operation instructions, click **Help** in the **Start Window** that appears after startup, and reference the help file.

① Click **Help**.



To display the GUI version, click **Help** in the Start Window when you run the software, and then click **About this Application**. The information pertaining to the version you are running will be displayed.

① Click **About this Application**.

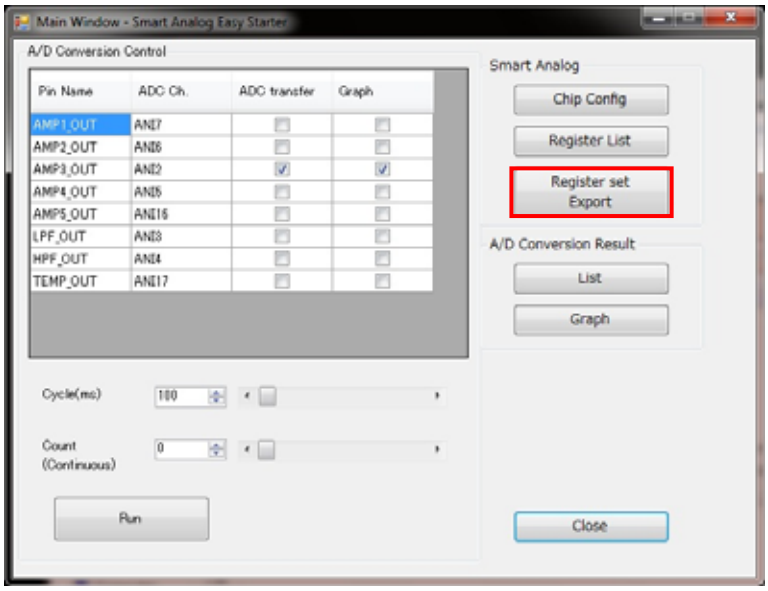


② Version information window opens.

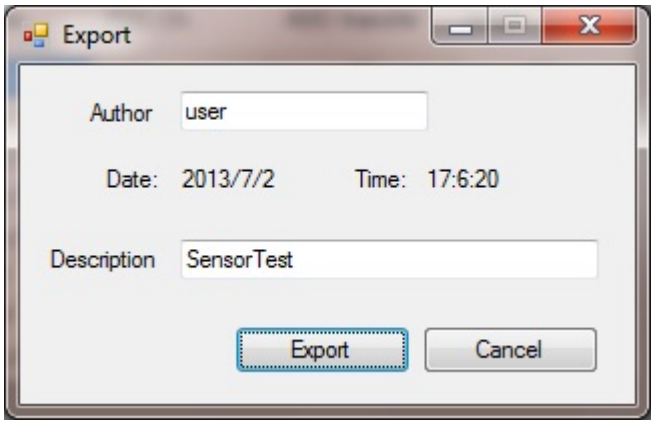
3.1.2.4 How to save the register setup files

The user can save the changes made to the register settings to a file, as shown below.

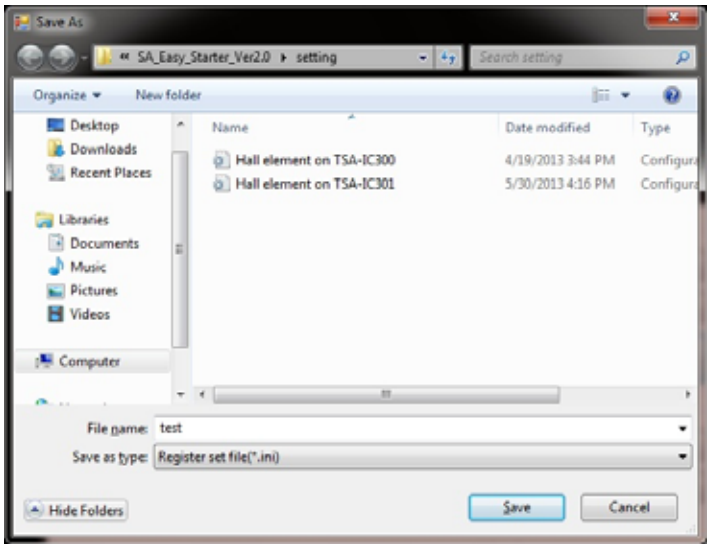
① Click **Register Set Export**.



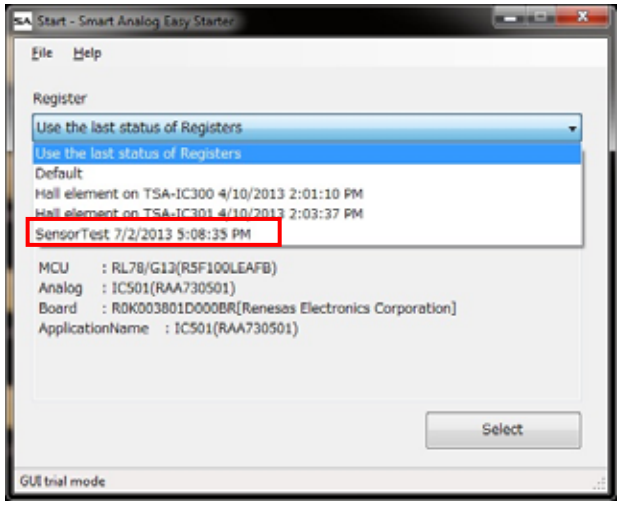
② Enter the author's name in the "Author" box and, in "Description," enter the characters to be displayed in the Register box that appears in the Start Window during startup. Finally, click **Export**. The example below shows "Sensor Test" input in the description box.



③ When the **Setting** folder is displayed, enter the file name and click **Save** .



④ For subsequent startups, **Sensor Test** will be displayed in the Register box in the Start Window.



3.1.3 Confirm *Smart Analog Easy Starter* Operations on TSA-IC30x

The following describes how to confirm the software operations on TSA-IC300. The same process can be used for TSA-IC301 by changing the contents of the Register box to "Target Board."

① Board Setup

Set the EB-RL78/G1A mode switch to UART mode and connect the board to the PC as shown in the figure below. Refer to **2.4.1 Power Supply** for details on power supply methods and to **2.4.2 Mode Switching** for instructions on how to switch modes.

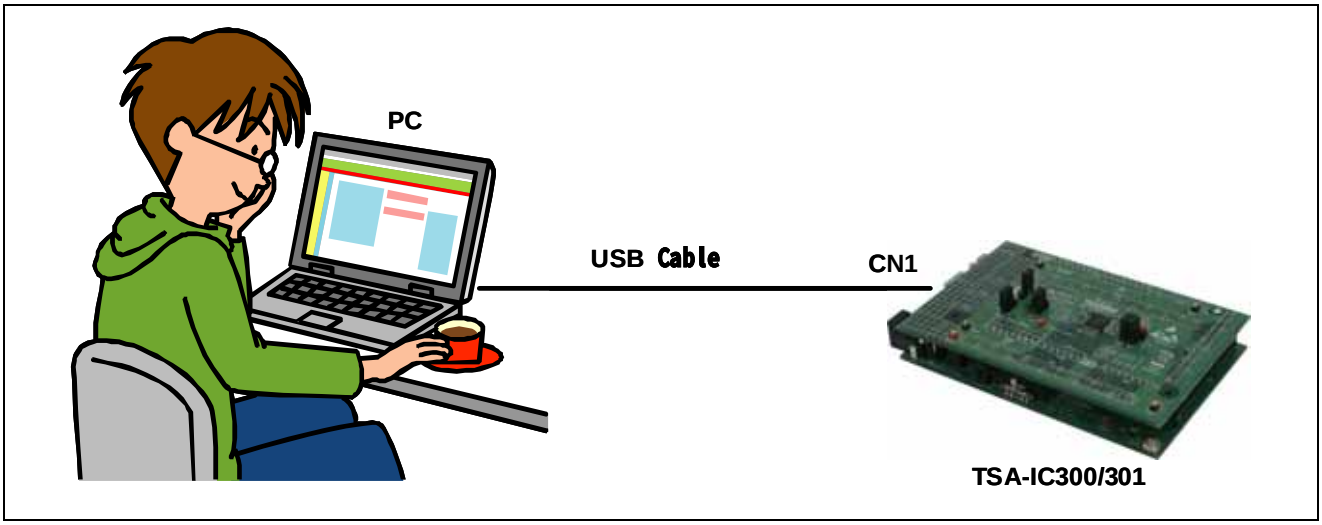


Figure 3.1 USB Board Connection

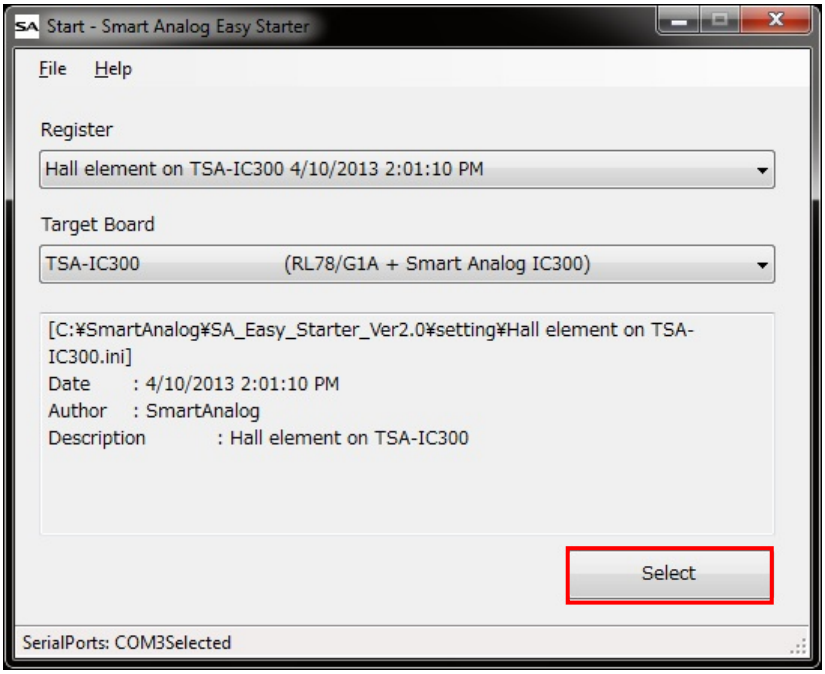
② Start the Smart Analog Easy Starter software

In the **Register** box, select "Hall element on TSA-IC300," the register setting file for the Hall sensor mounted on the TSA board.

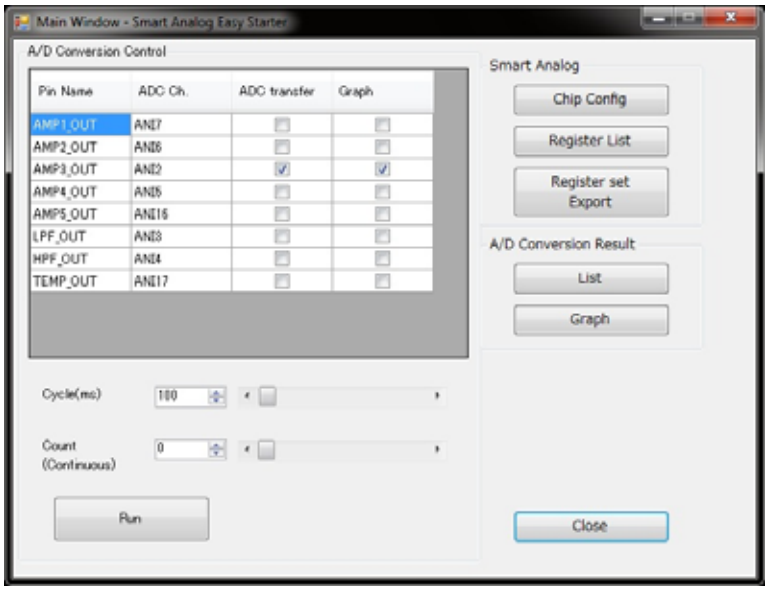
In the **Target Board** box, select "TSA-IC300 (RL78/G1A+Smart Analog IC300)."

After making both selections, click **Select**. The following is an example of the window when setting TSA-IC301.

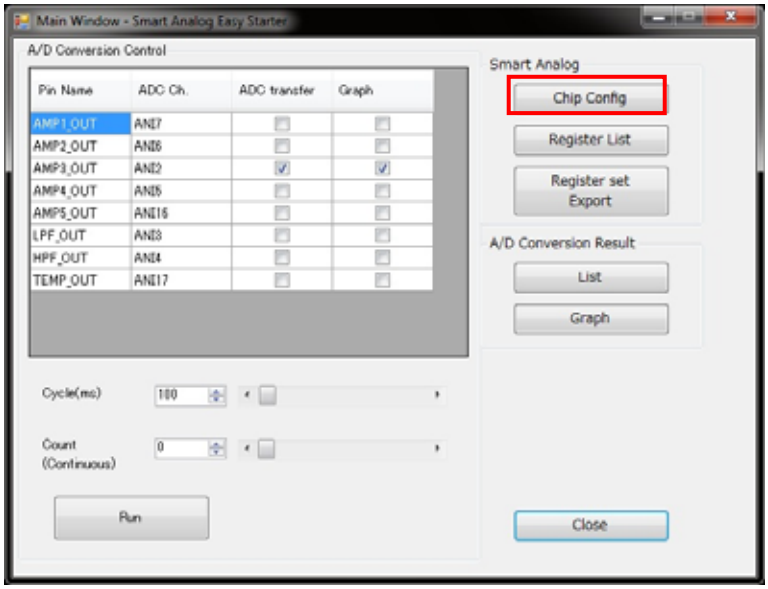
Register	Hall element on TSA-IC301
Target Board	TSA-IC301(RL78/G1A + Smart Analog IC301)

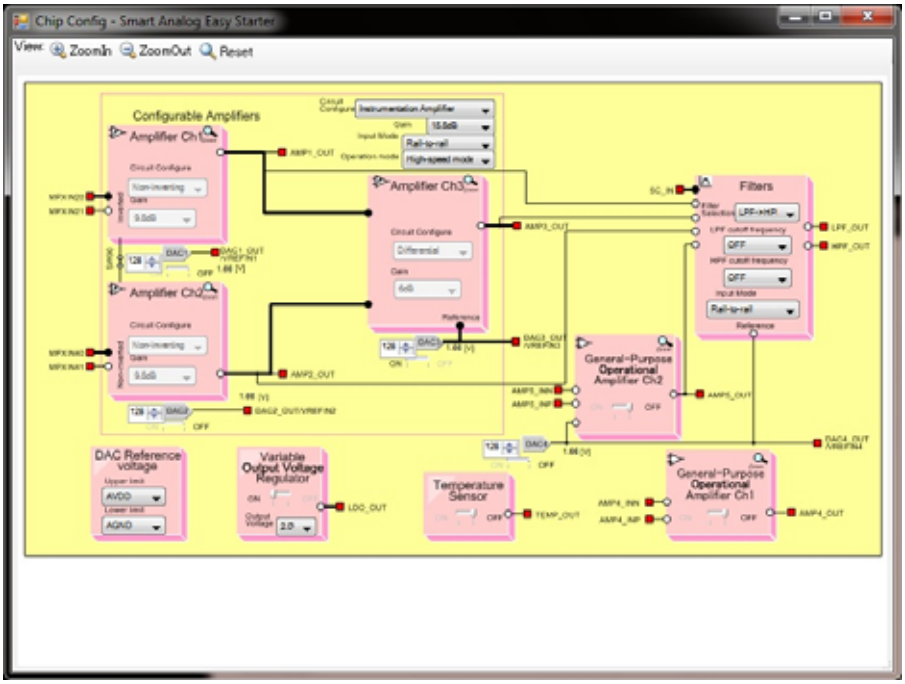


③ The program's Main Window is then displayed.



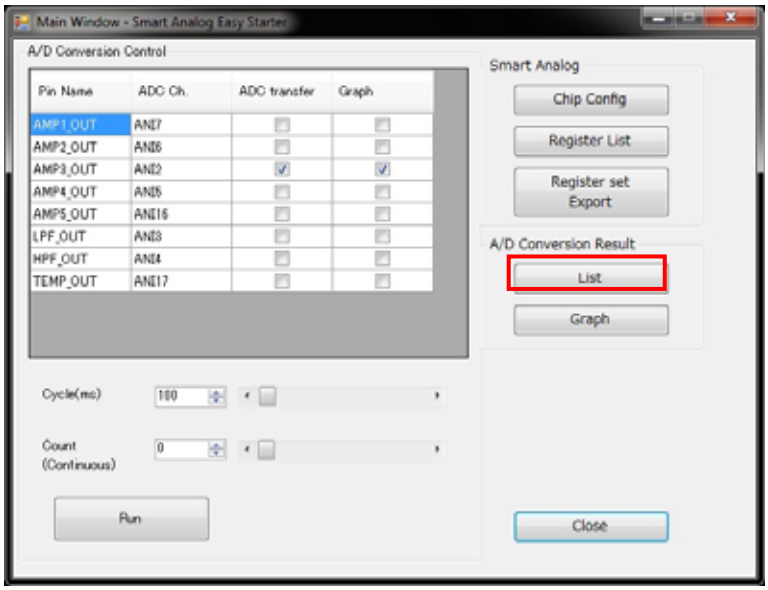
④ Click **Chip Config** to view the Chip Config window. This window shows the settings for the analog section of the Smart Analog IC300. The user can change the gain, amp and other settings here. Refer to the help file for more details.

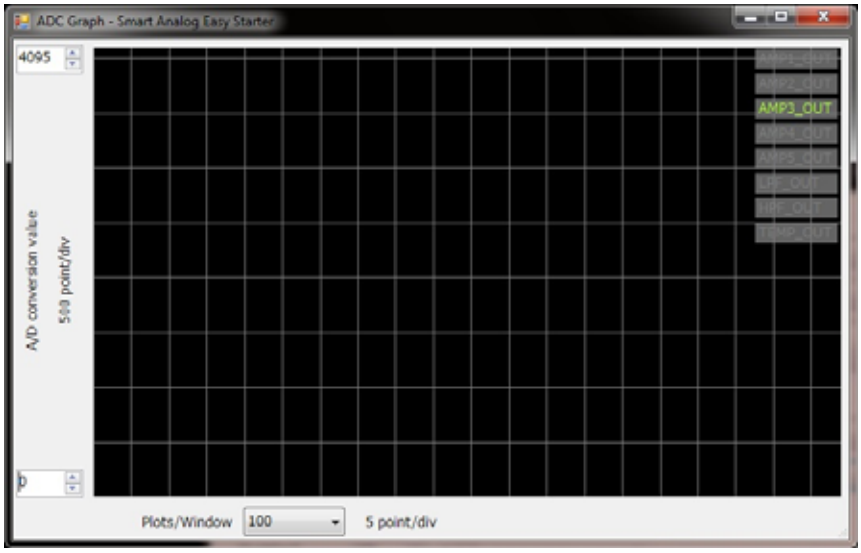




Chip Config Window

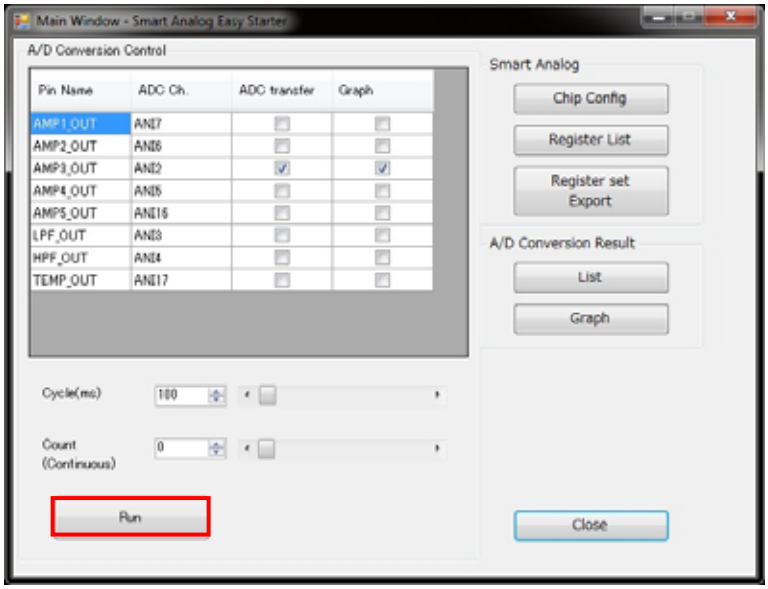
⑤ Click **Graph** to open the ADC Graph window. This window shows the A/D conversion results for the analog output channel (CH) set in the **Graph Display** box. A/D conversion results are displayed in the ADC Graph window because "ADC transfer" and "Graph" are both selected for AMP3OUT, as shown below.





ADC Graph Window

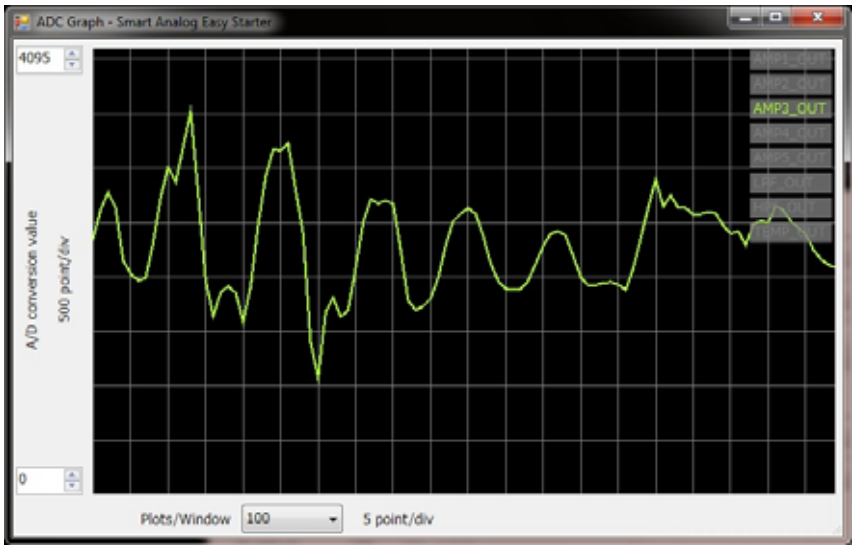
⑥ Next, click **Run**. This starts the A/D conversion, and displays the results in the ADC graph window.



Note that the A/D conversion value may be affected by the intensity of a magnet if placed too close to the Hall sensor. The red outline in Figure 3.2 indicates the position of the Hall sensor.

Figure 3.2 EB-IC300 Position of Hall Sensor on EB-IC300

⑦ Next, click **Stop**. This stops the A/D conversion and terminates the display of A/D conversion results in the ADC Graph window.



4. Debugging with CubeSuite+

This section explains how to debug a program using CubeSuite+. There are two ways to debug: USB I/F or E1 I/F. The commonalities between these two methods are presented first, followed by a detailed explanation of each. The explanations here assume the use of Windows 7 as the OS, and CubeSuite+ version V2.00.00 [15 Mar 2013]. Refer to the help file for details on CubeSuite+ functions and operations.

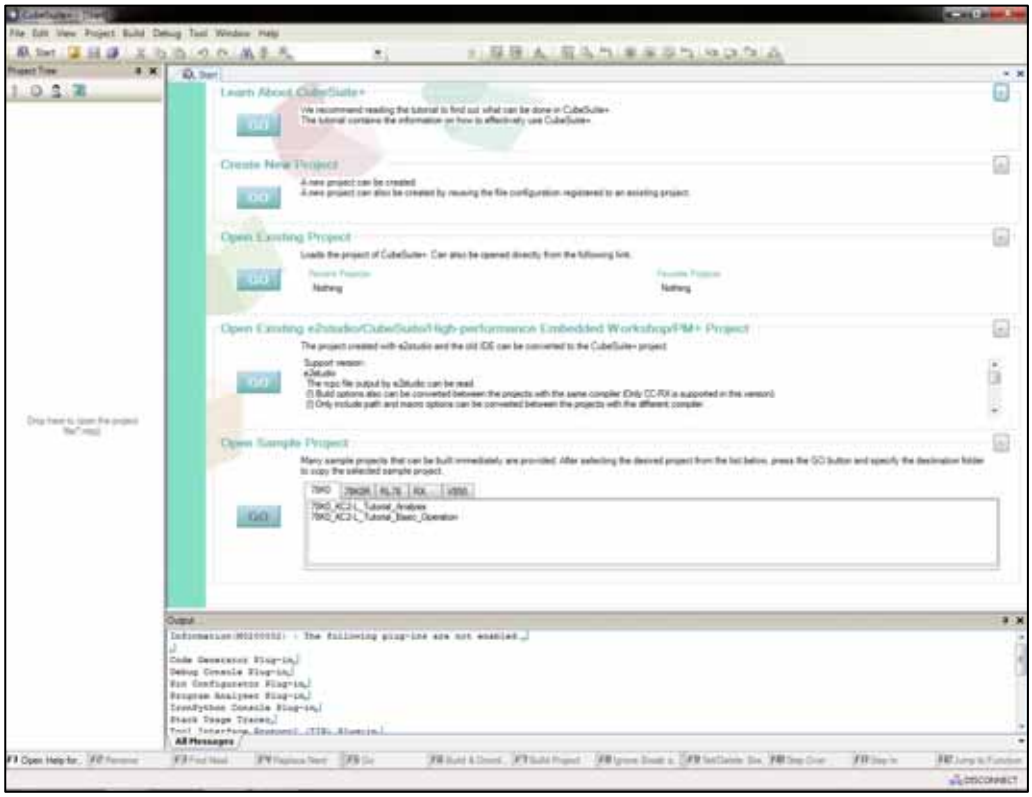
- Creating a project with CubeSuite+
- When using a USB I/F connector
- When using an E1 I/F connector (with power supply from the E1 emulator)
- When using an E1 I/F connector (without power supply from the E1 emulator)
- Debug using CubeSuite+

4.1 Creating a project with CubeSuite+

The following explains the process of creating a project with CubeSuite+.

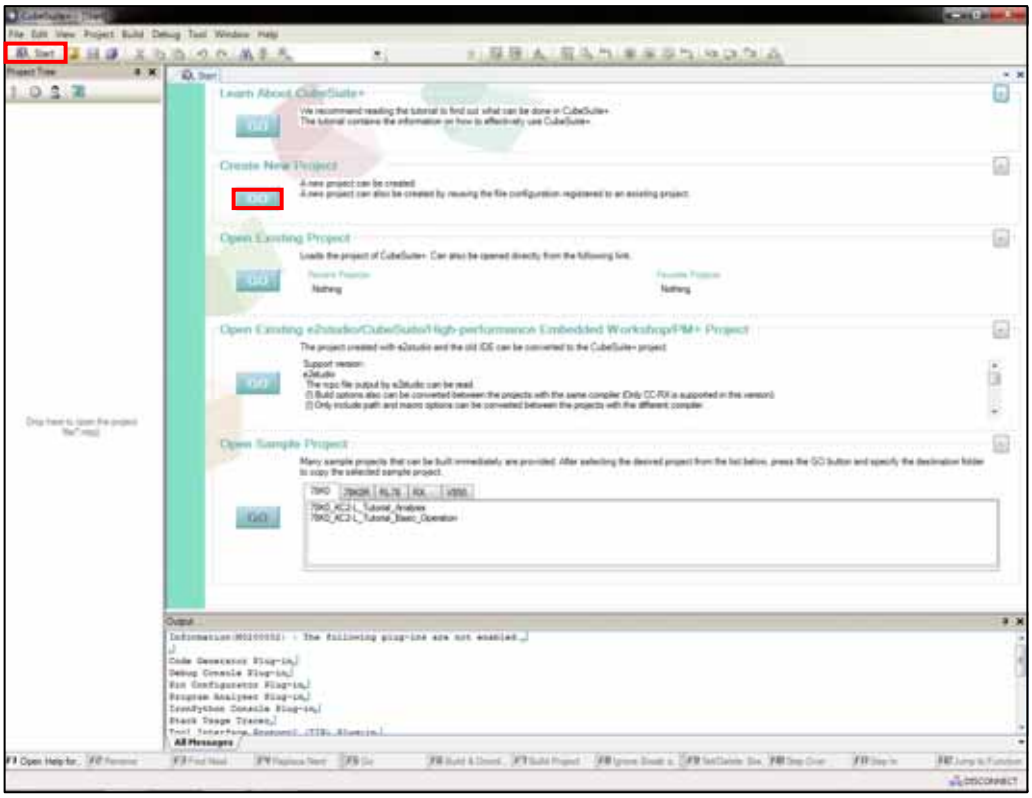
① Start CubeSuite+

The following window is displayed when CubeSuite+ is started.



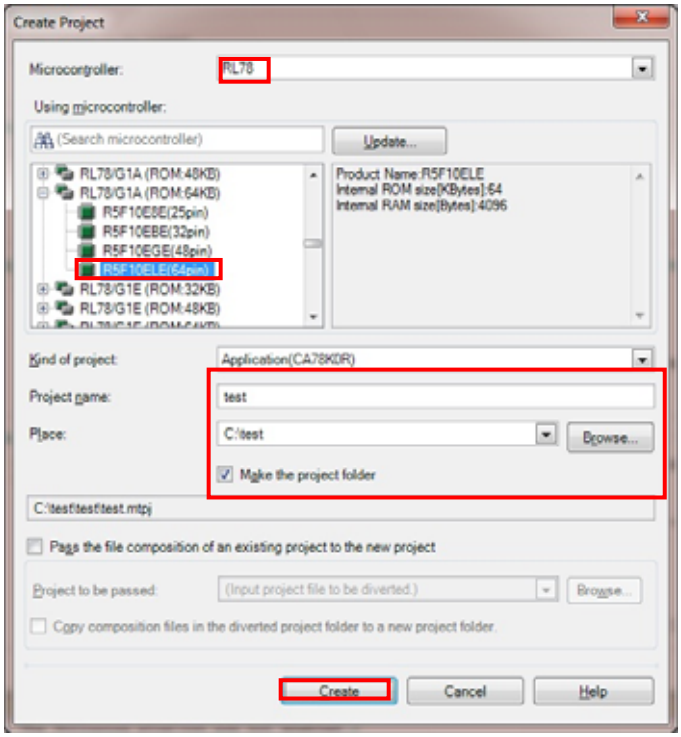
② Start window display

If the display is different, click **Start** to display the Start window. Click **Create New Project** and then **GO**.



③ Create Project window settings

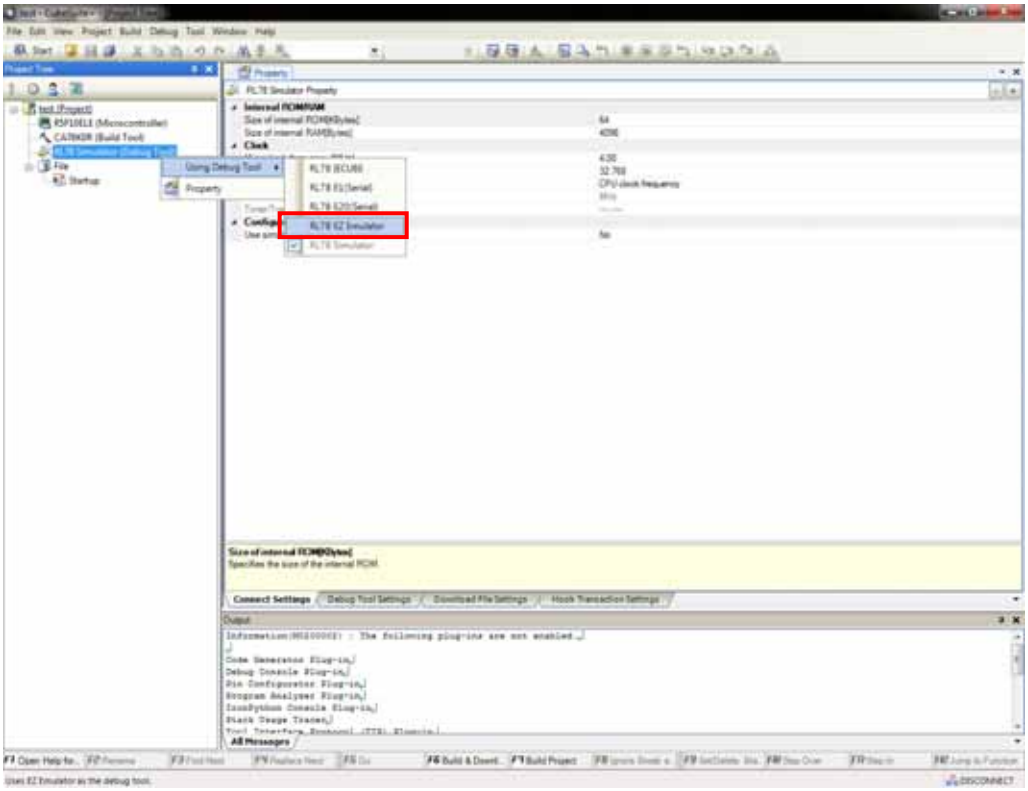
Enter the settings (see list below) in the **Create Project** window. After all settings are complete, click **Create**.



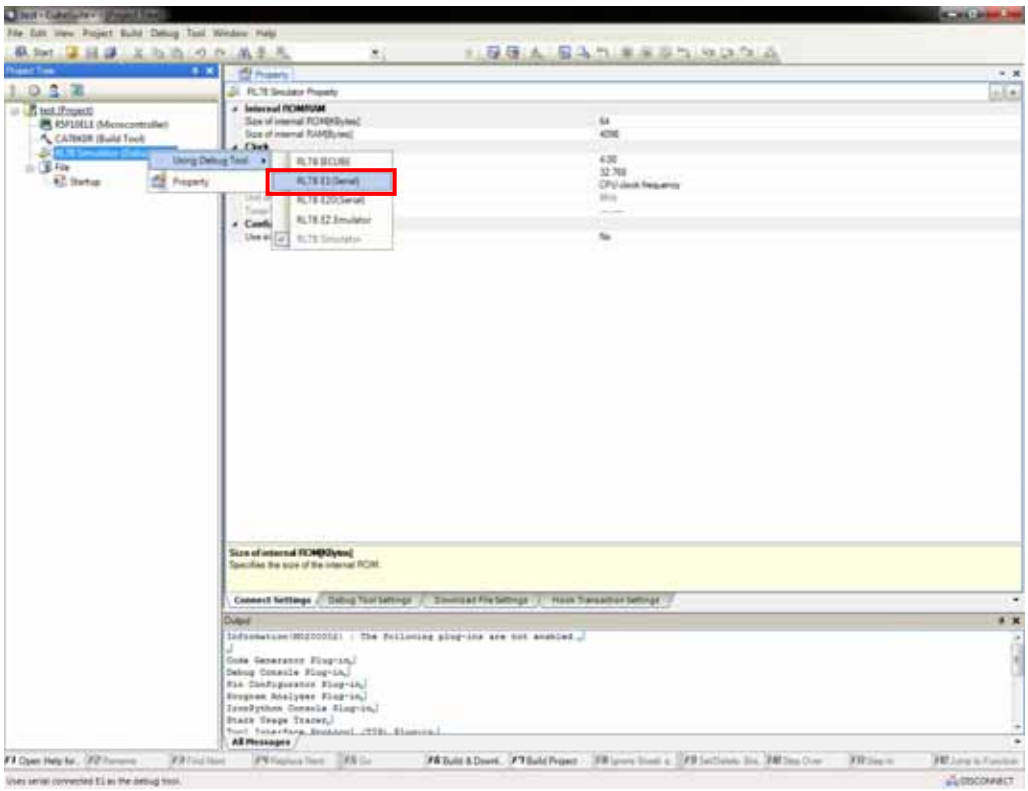
Microcontroller:	RL78
Using Microcontroller:	R5F10ELE(64pin)
Project name:	determined by user
Place:	determined by user
Make the project folder:	determined by user

④ Debug tool settings

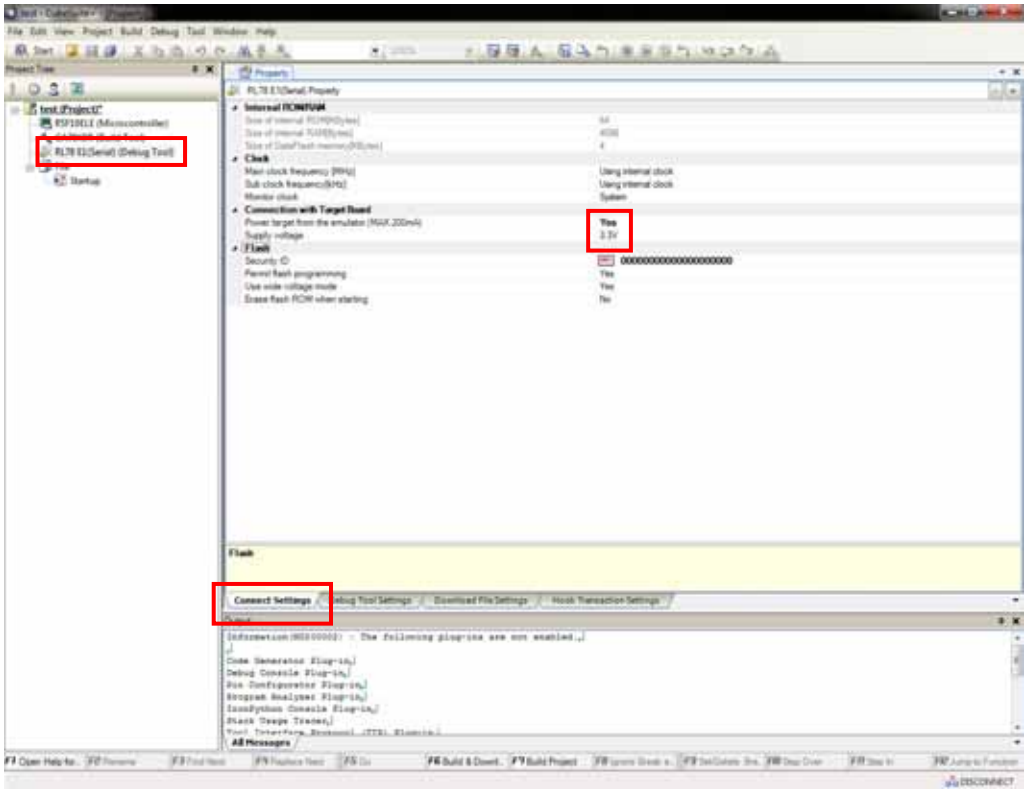
When using USB I/F: change the debug tool to RL78EZ Emulator.



When using E1 I/F: change the debug tool to RL78 E1 (serial).



Modify the settings listed below to meet the debug tool connection requirements.



When supplying power from the emulator:

Supply power from emulator? (Max 200mA) Yes

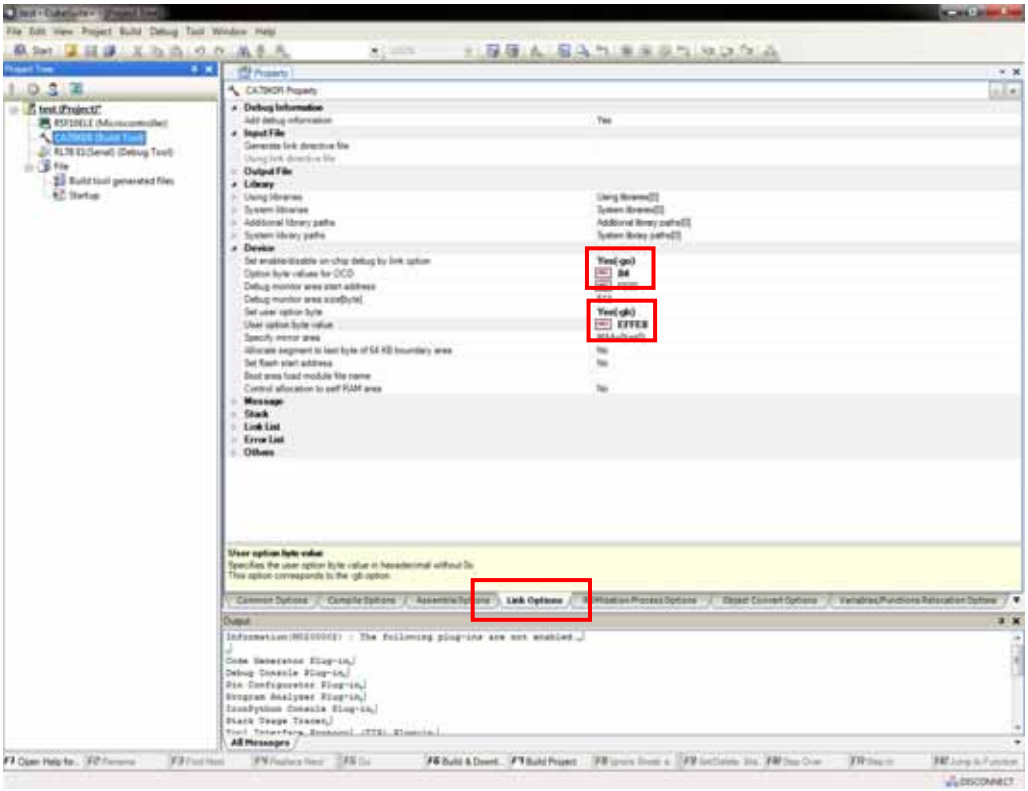
Supply voltage 3.3V

When not supplying power from the emulator:

Supply power from emulator? (Max 200mA) No

⑤ Build tool settings

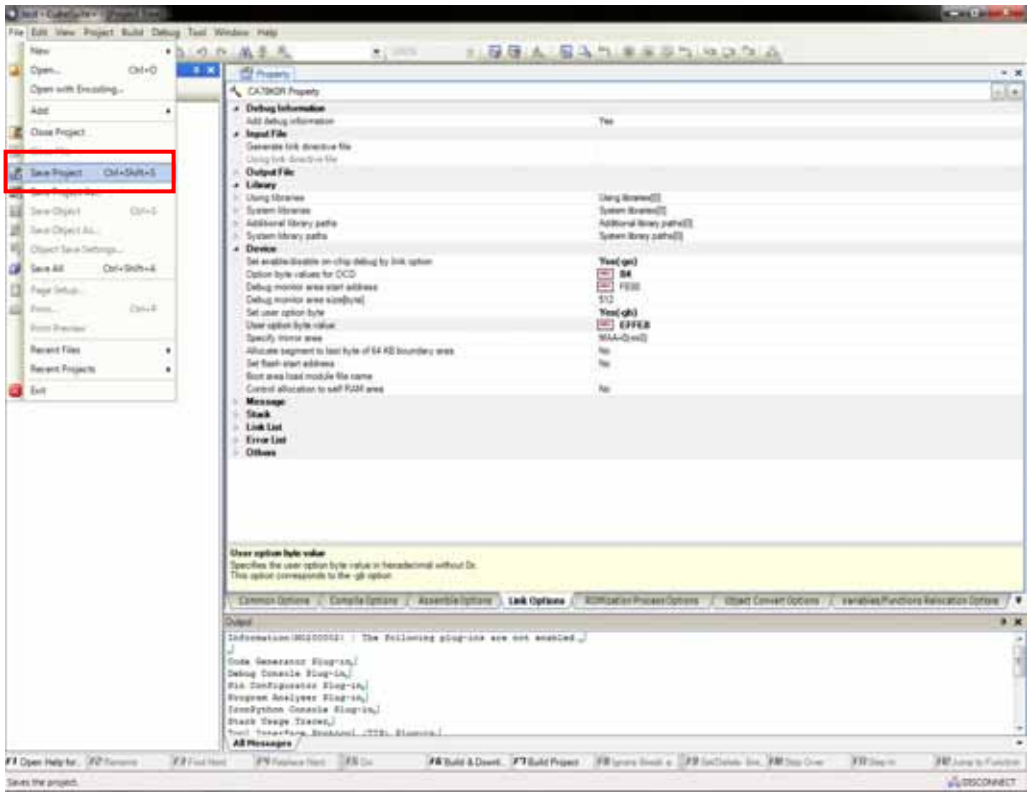
Set the build tool link options as indicated below.



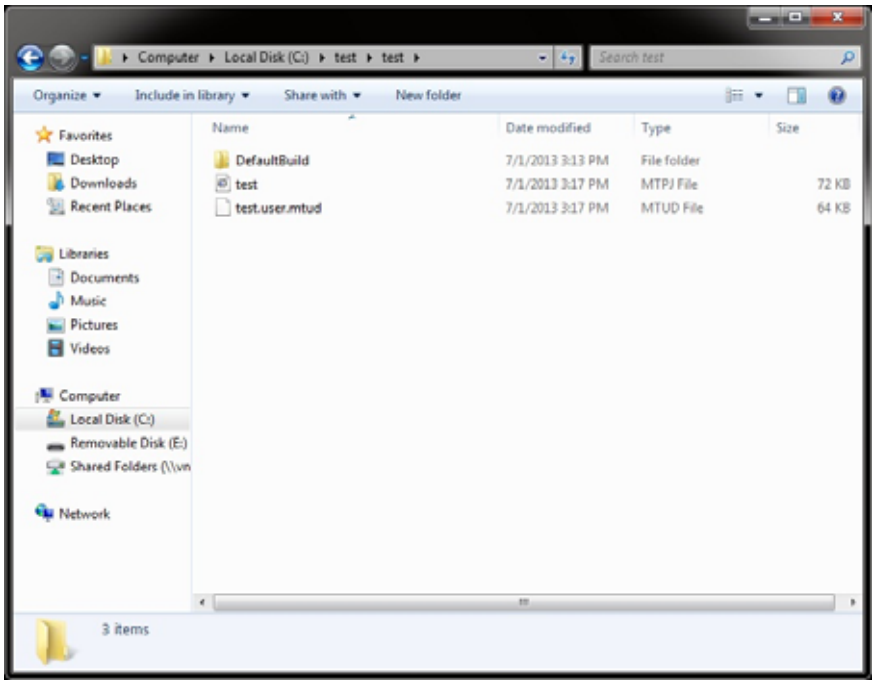
Set enable/disable on-chip debugging?	Yes (-go)
On-chip debug option control byte value	84
Set user option bytes?	Yes (-gb)
User option byte value	EFFE8

⑥ Save project

Save the project by executing **Save project** under the **File** tab.

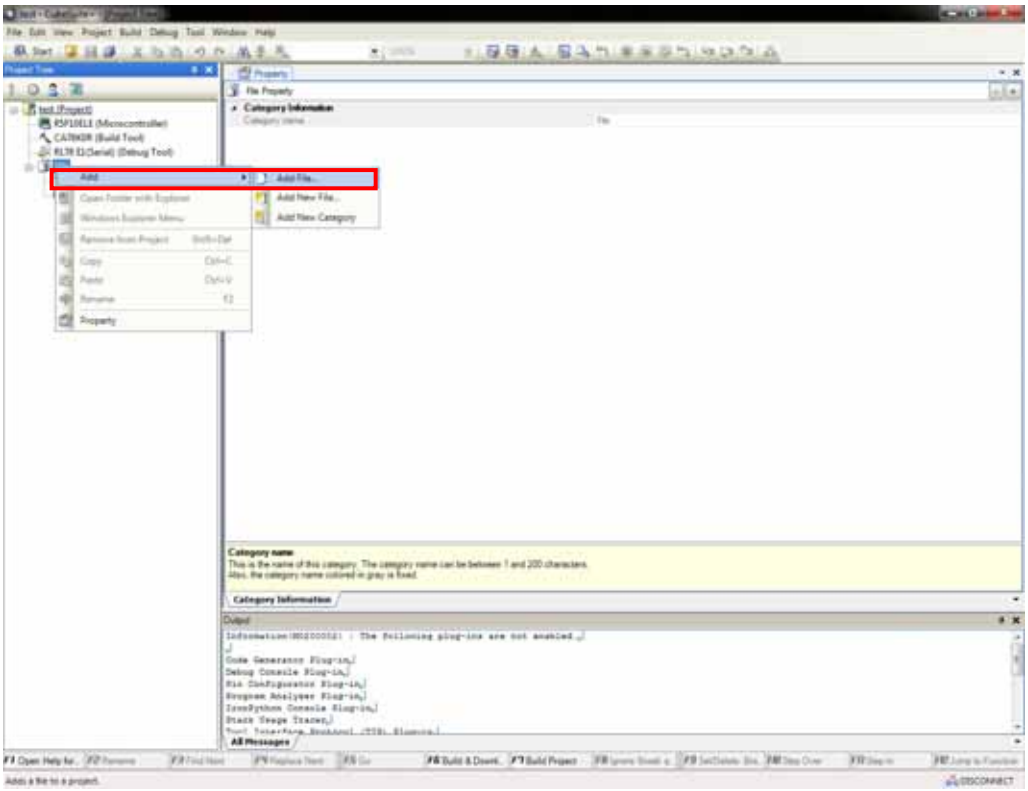


The following files are created.

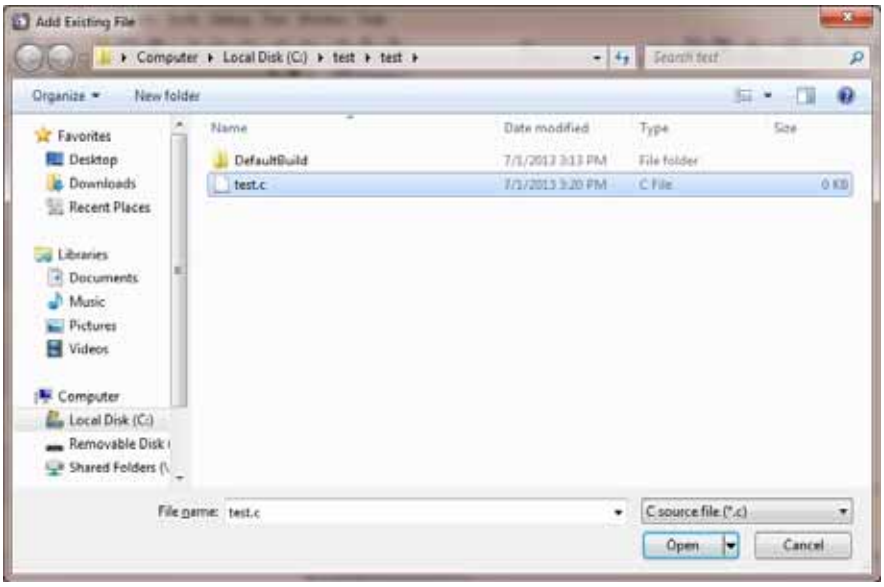


⑦ How to add a source

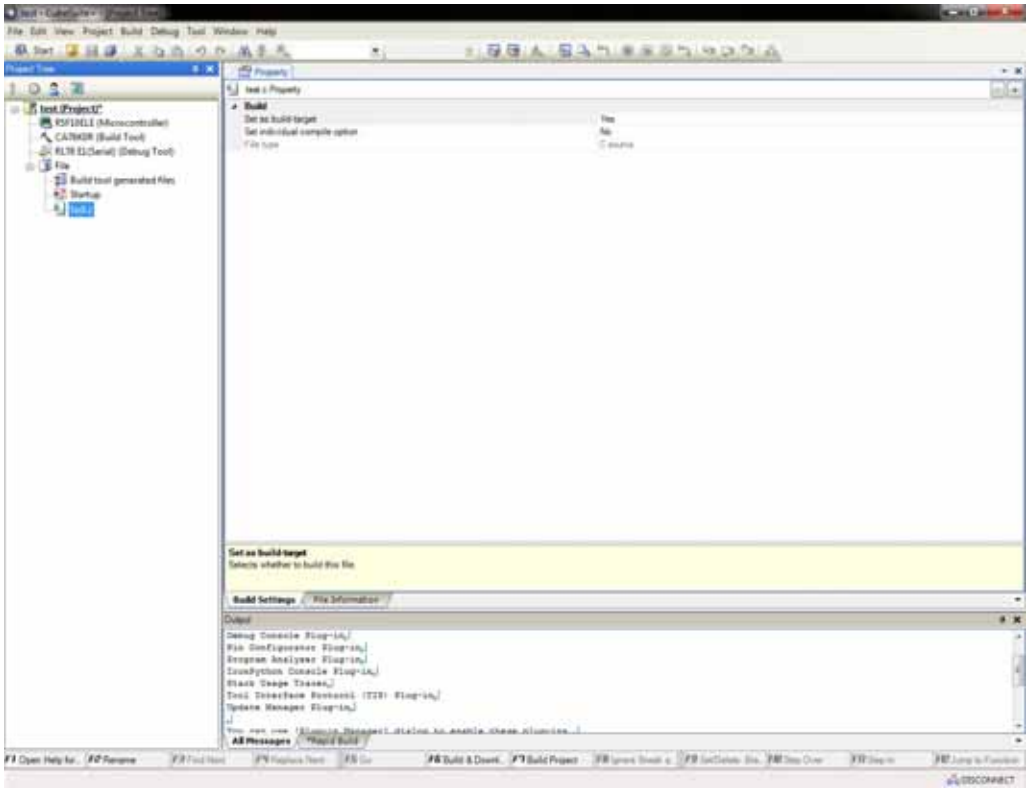
This section explains how to add a source. Select the project tree file, and right click to open the following menu. Select **Add**, then **Add file** .



The File Selection window will come up. Select the files, then click to **Open**.



Confirm that the file names were added to the project tree.



4.2 Debugging Setup

This section describes the board settings for debugging with CubeSuite+.

4.2.1 When using the USB I/F connector

The following describes the board settings for debugging with CubeSuite+ using the USB I/F interface.

① Board setup

Set the mode switch on EB-RL78/G1A to OCD mode, and connect as shown in the figure below. For details concerning the power supply method, refer to **2.4.1 Power Supply**. Refer to **2.4.2 Mode Switching** for more information concerning how to switch modes.

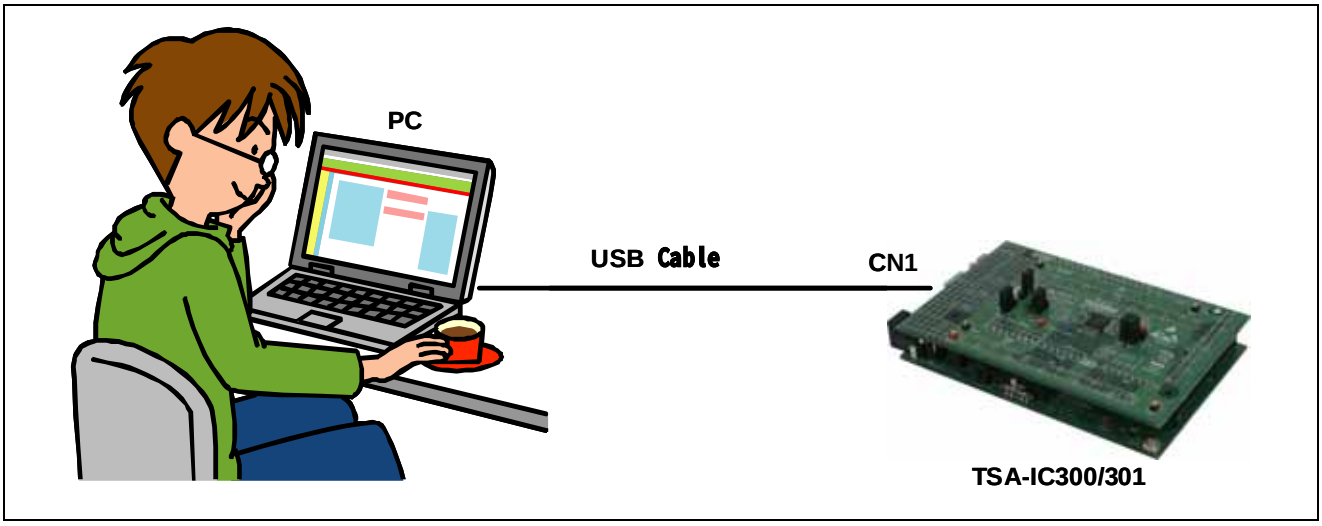


Figure 4.1 Board Connection via USB Cable

② USB Cable Connection & Communications

Connect the board to the PC using a USB cable. Confirm that the EB-RL78/G1A LED1 is on.

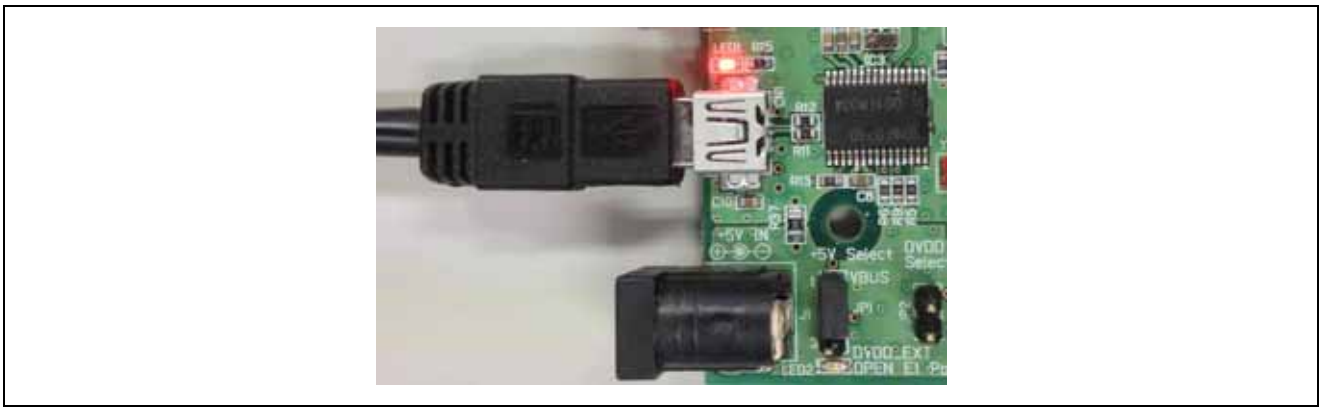


Figure 4.2 LED ON (for USB connection)

4.2.2 When using the E1 I/F connector

The following describes the board settings for debugging with CubeSuite+ using E1 interface.

① Board setup

Set the mode switch on EB-RL78/G1A to UART mode, and connect as shown in the figure below. Specify **Method Selected** for **Create a new project** as the power supply method. For details, refer to **2.4.1 Power Supply**. Refer to **2.4.2 Mode Switching** for more information concerning how to switch modes.

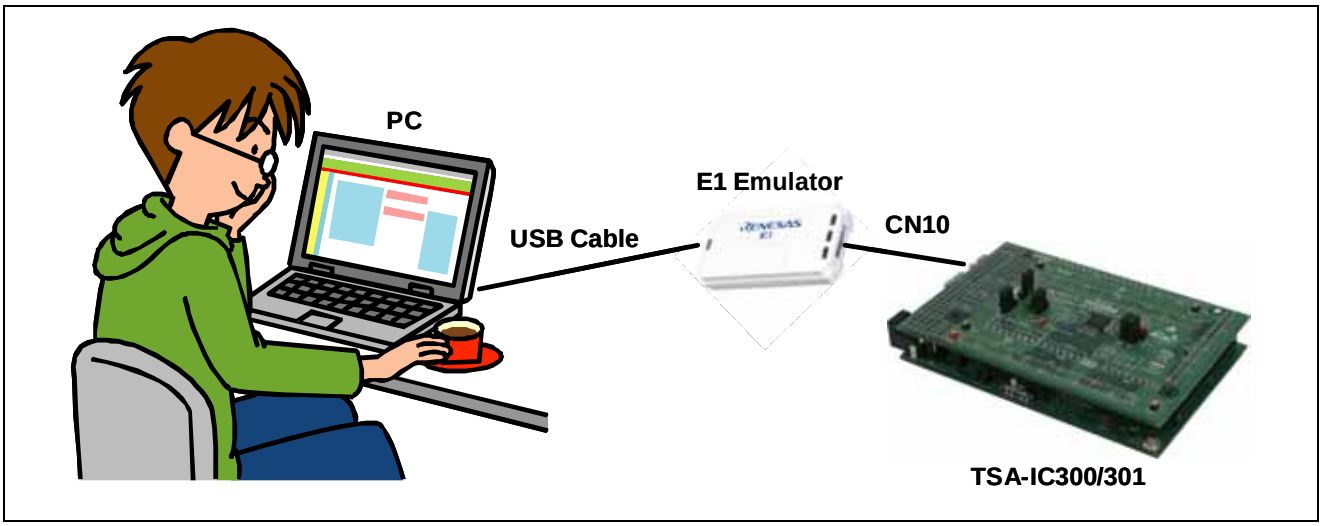


Figure 4.3 Board Connection via E1 Cable

② E1 emulator connection

Connect the E1 emulator to connector CN10.

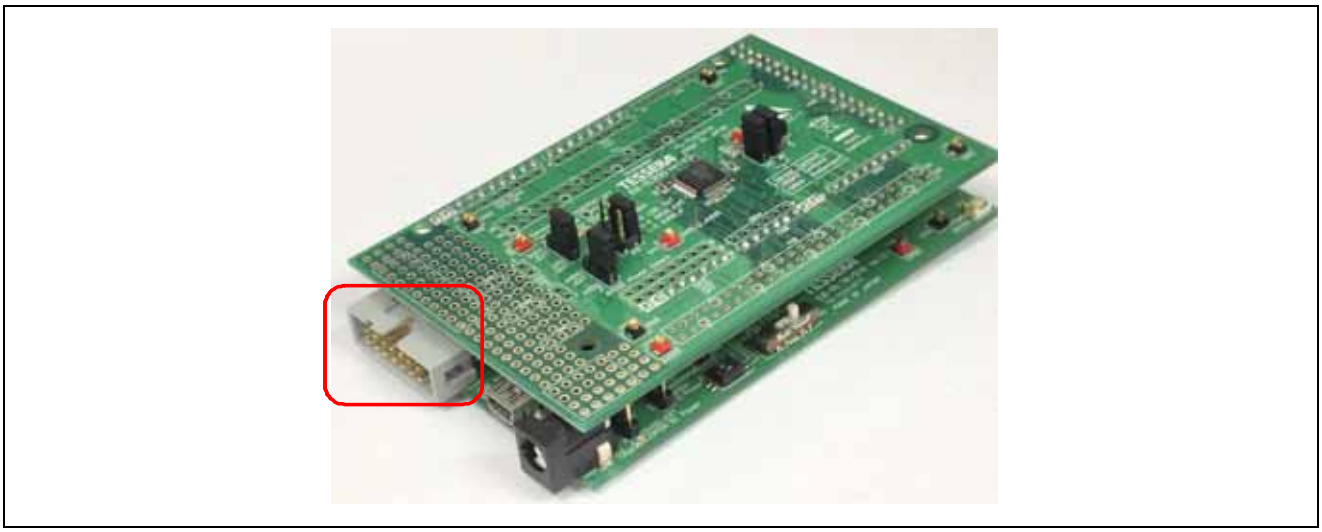


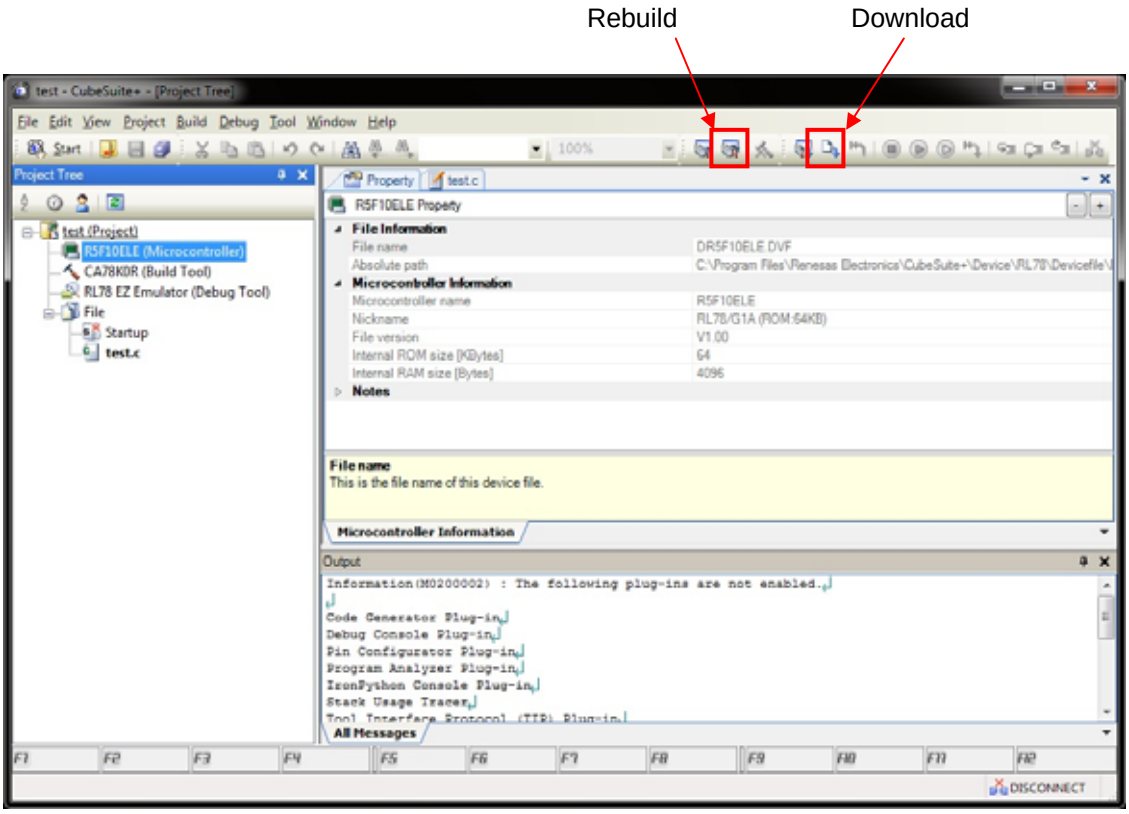
Figure 4.4 E1 Emulator I/F Connector Position

4.3 Debugging with CubeSuite+

This section explains how to debug a program with CubeSuite+. The operations described here apply whether you are using EZ Emulator or the E1 Emulator.

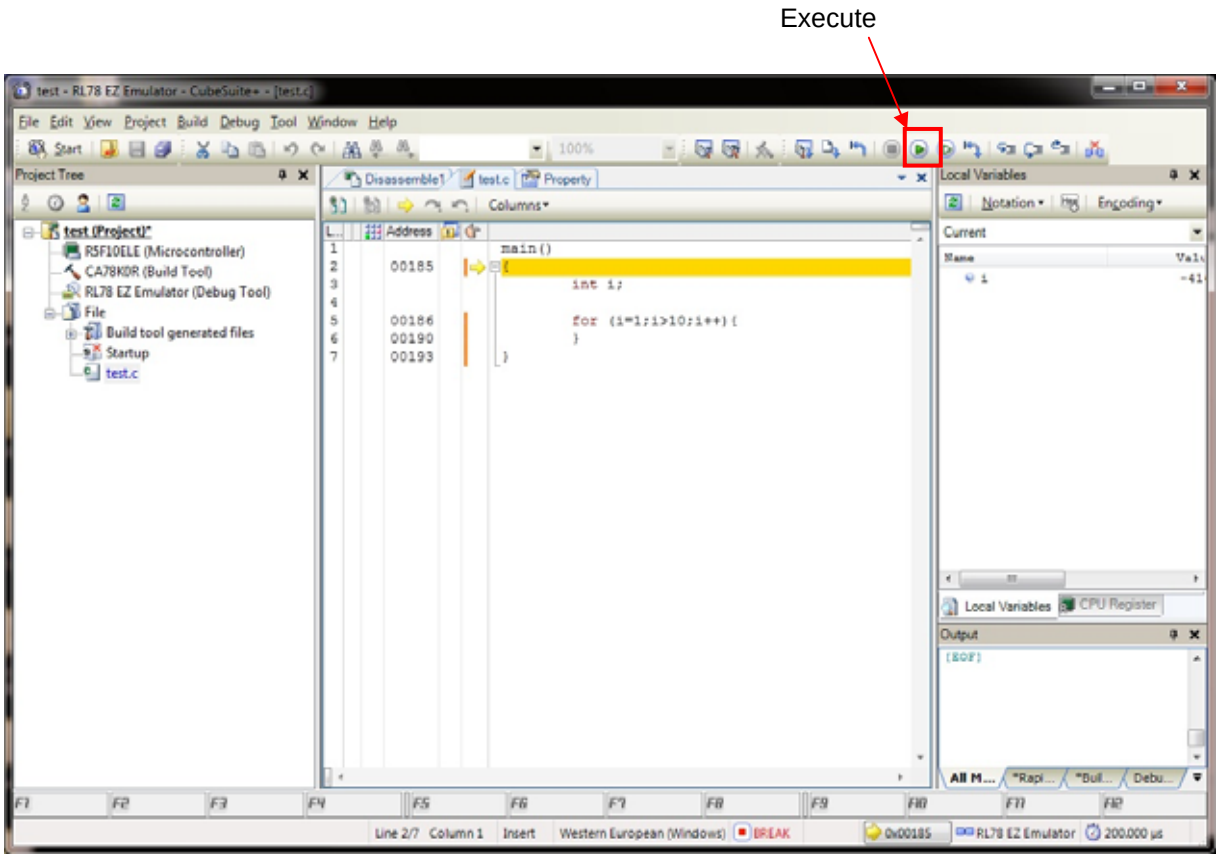
① Start a project

Start the project you created using CubeSuite+ as described in section 4.1. Select the project according to the tool you are using (if using E1, this includes the power supply method as well). Rebuild the C source. Supply power to the board and run the download.



② Execute project

When the tool is connected, the following window will open. Click the Execute icon and the program will be executed. Refer to the help file for more details on CubeSuite+ functions and operations.



5. Programming the CPU with the Renesas Flash Programmer

This section explains how to program the CPU using the Renesas Flash Programmer (RFP). There are two ways to program. The commonalities between these two methods are presented first, followed by a detailed explanation of each. The explanations here assume the use of Windows 7 as the OS, and RFP version V2.00.01 [26 Oct 2012]. Refer to the help file for details on RFP functions and operations.

- Creating a workspace in RFP
- When using a USB I/F connector
- When using an E1 I/F connector (with power supply from the E1 emulator)
- When using an E1 I/F connector (without power supply from the E1 emulator)
- Programming the CPU with RFP

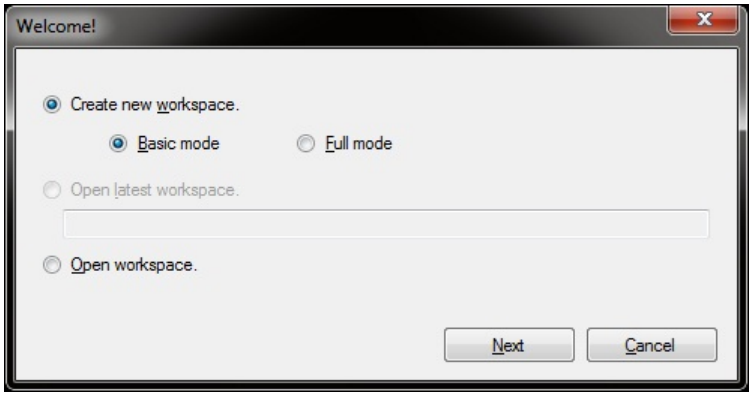
5.1 Creating a workspace in RFP

The following explains the process of creating a workspace in RFP.

① Creating a workspace in RFP

The following window is displayed when RFP is started.

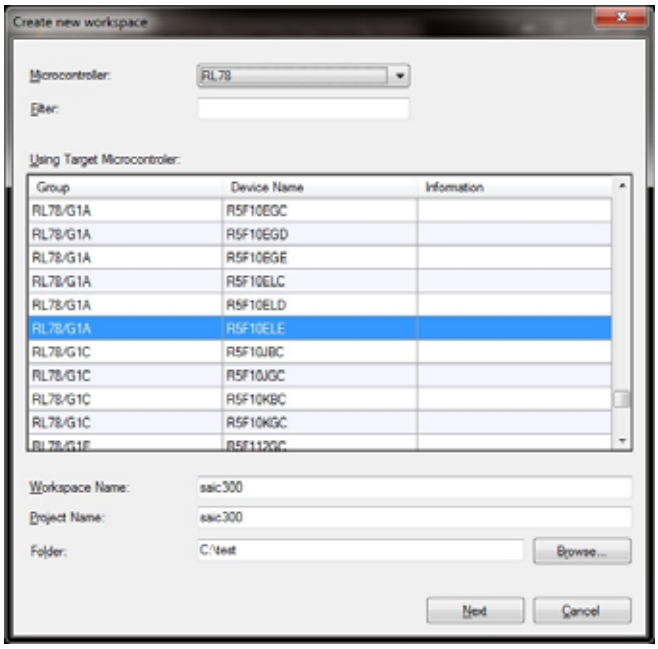
Select **Create new workspace** , specify **Basic mode** , and then click **Next** .



② Select the device

Microcontroller	RL78
Target to be used	RL78/G1A R5F10ELE
Workspace name	Determined by user
Project name	Determined by user
Location	Determined by user

After all settings are selected, click **Next** .



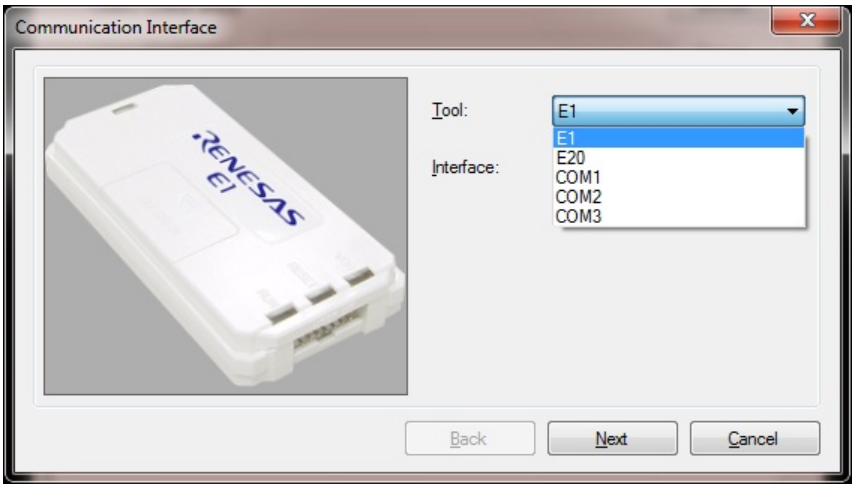
③ Set communication interface

Select the programming method.

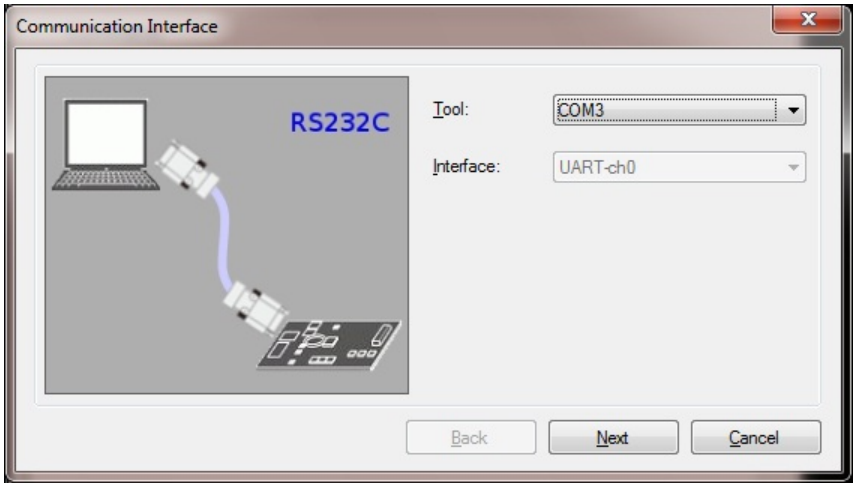
When using USB I/F connector: COMx (x can be any value from 1 to 256)

*Board must be connected to PC beforehand.

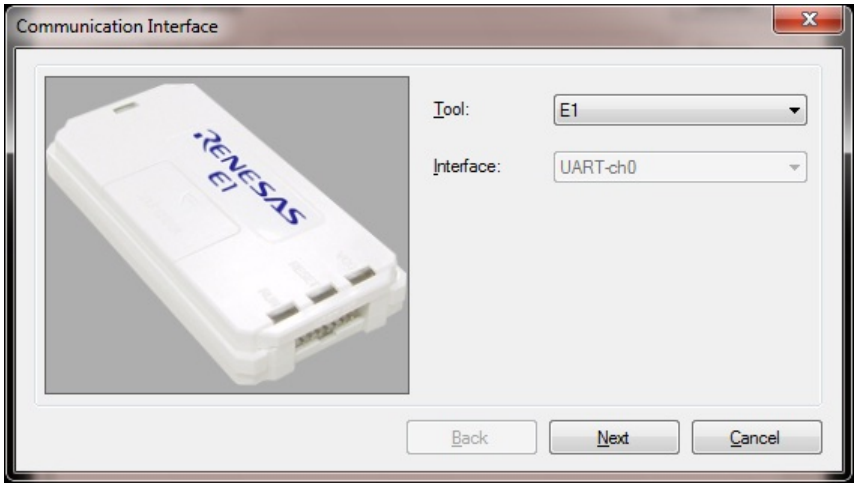
When using E1 I/F connector: E1



When using COMx:



When using E1:

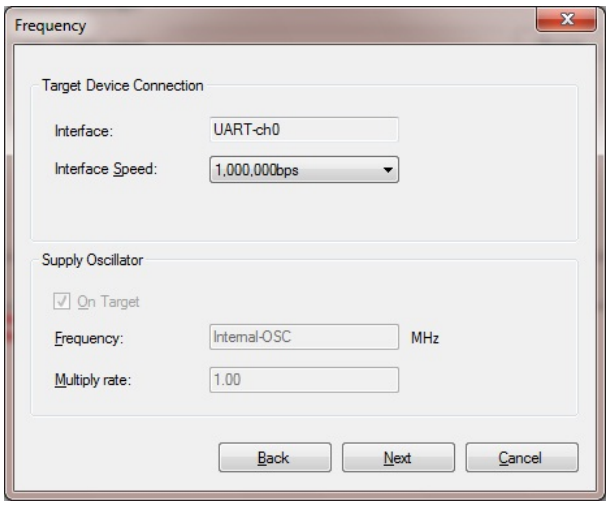


Click **Next (N)**.

④ Set supply clock

Clock supply is only set when using E1.

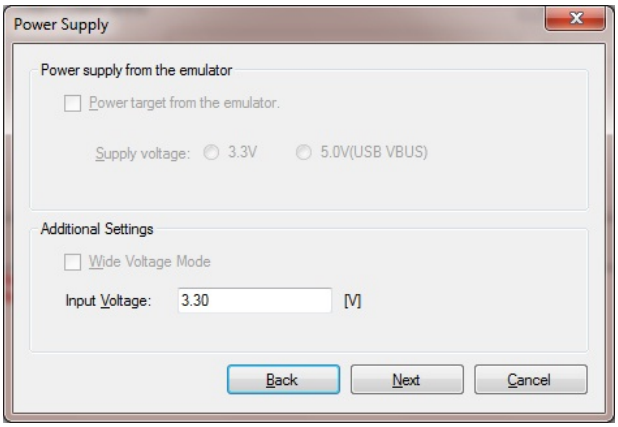
Confirm the interface speed setting, and then click **Next .**



⑤ Set power supply

When using COMx:

Confirm that input supply voltage (V) is 3.30V, and then click **Next** .

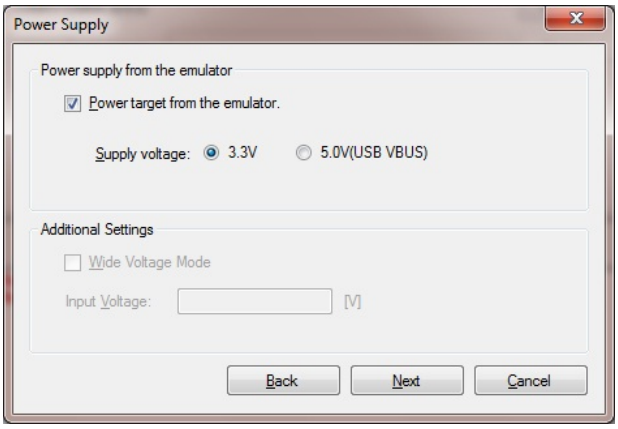


When using E1:

When using power supply from the E1 emulator, select the settings shown in the window below.

If power supply is not from the E1 emulator, clear the **Power target from the emulator** box

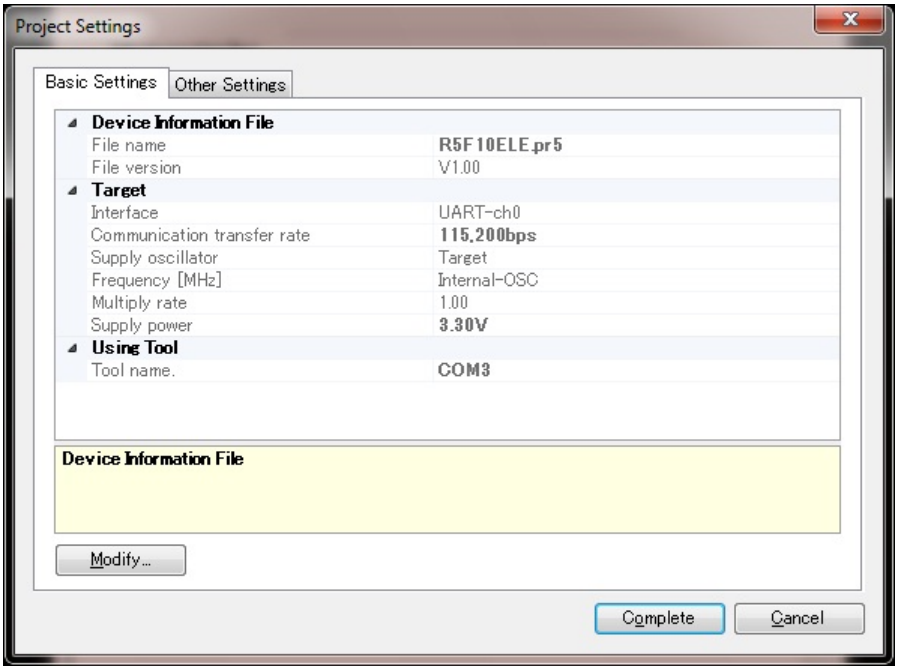
Click **Next** .



⑥ Project Settings

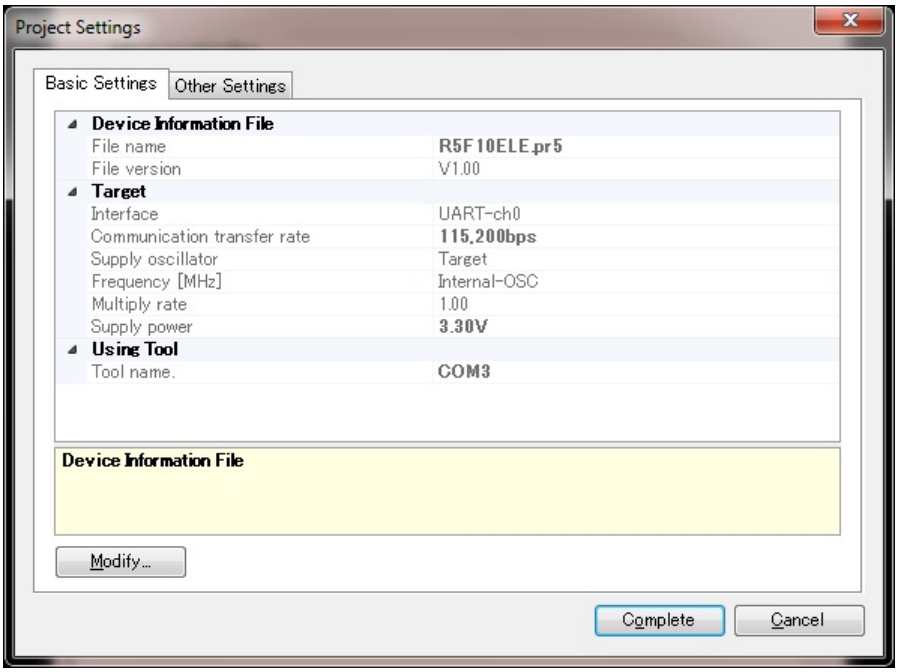
When using COMx:

Confirm the settings in the dialog box. The **Tool Name** under **Using Tool** should be COMx (x: any number from 1 to 256). Once the information is confirmed, click **Complete** .



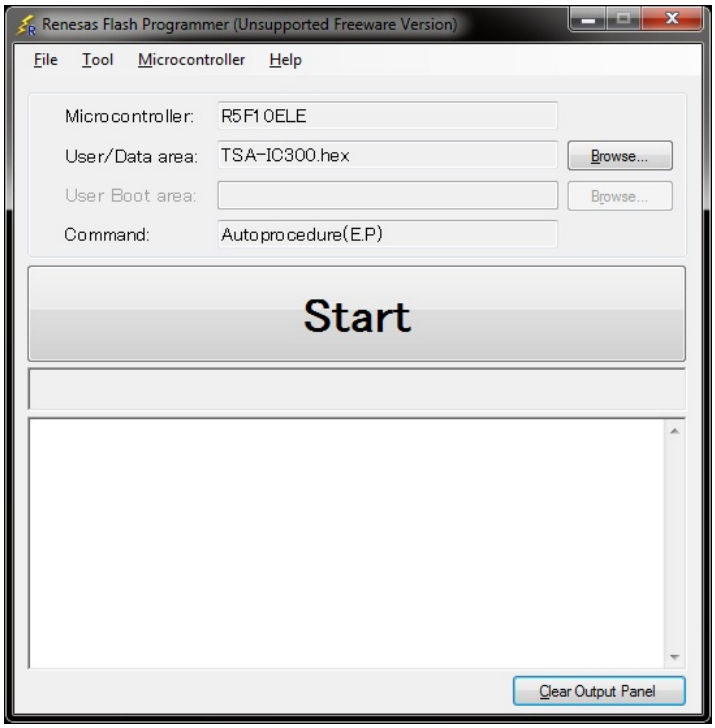
When using E1:

Confirm the settings in the dialog box. The **Tool Name** under **Using Tool** should be E1. Once the information is confirmed, click **Complete** .

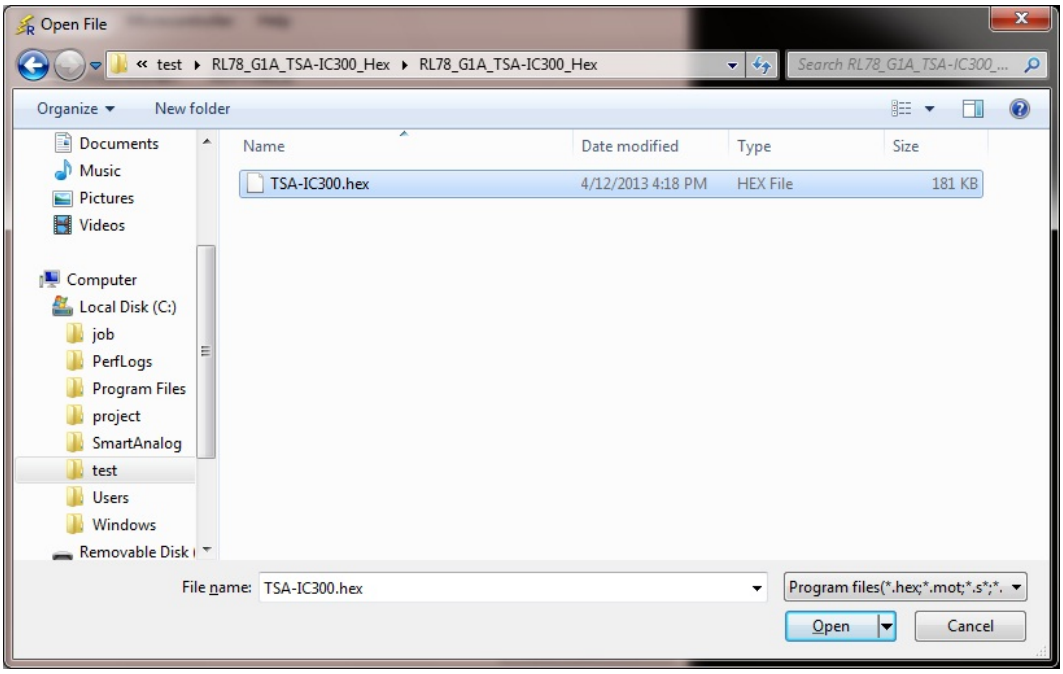


⑦ Set HEX program file

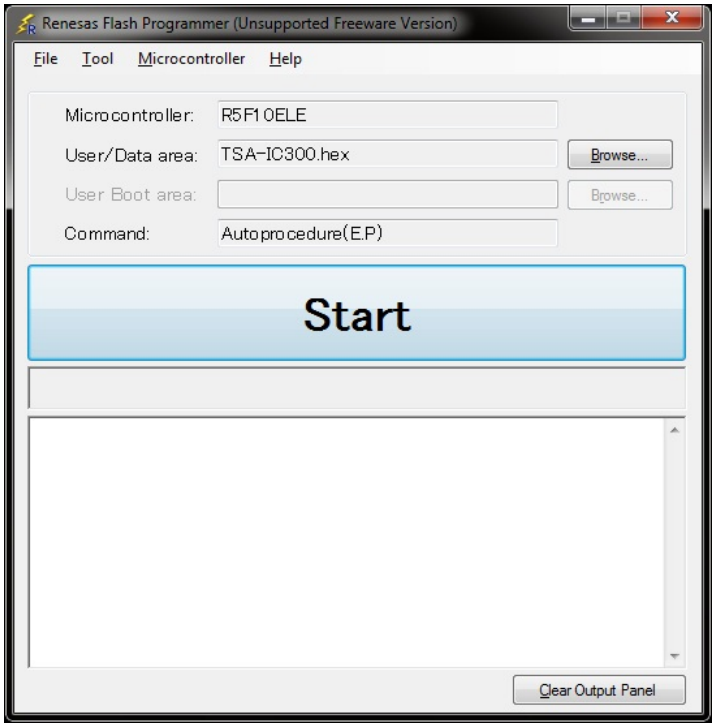
Click **Browse** .



Select the desired program file and click **Open** .



Confirm that the desired program file name is displayed in the dialog box.



5.2 CPU Programming Setup

This section describes how to set the board to program the CPU with RFP.

5.2.1 When using the USB I/F connector

This section describes how to set the board to program the CPU with RFP when using USB interface.

① Board setup

Set the EB-RL78/G1A mode switch to OCD mode and connect the board to the PC as shown in the figure below. Refer to **2.4.1 Power Supply** for details on power supply methods and to **2.4.2 Mode Switching** for instructions on how to switch modes.

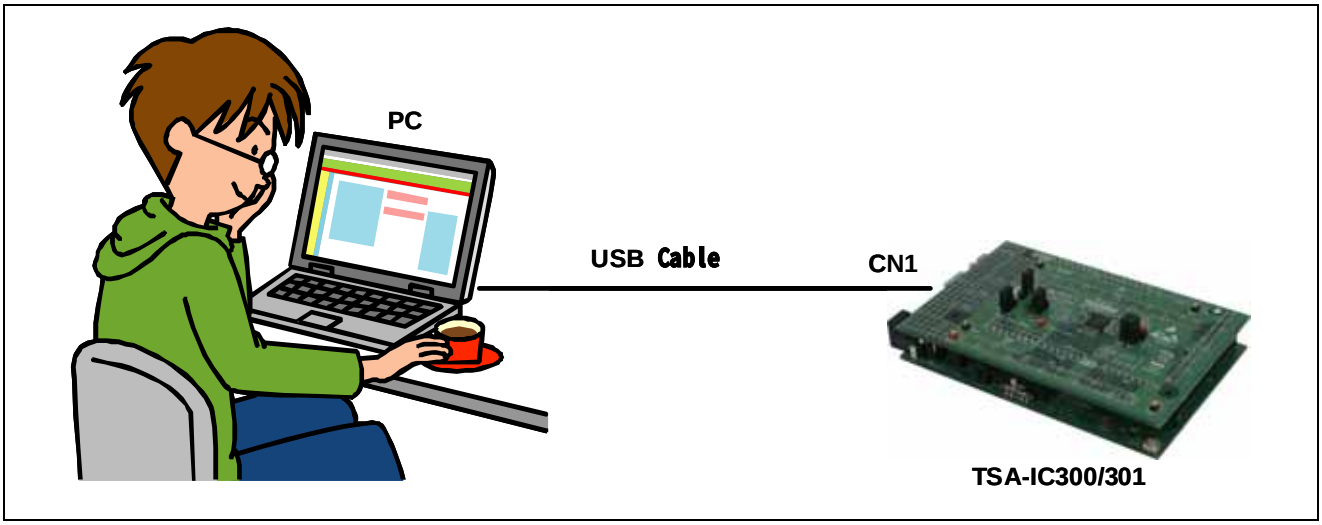


Figure 5.1 USB Board Connection

② USB Cable Connection & Communications

Connect the board to the PC using a USB cable. Confirm that the EB-RL78/G1A LED1 is on.

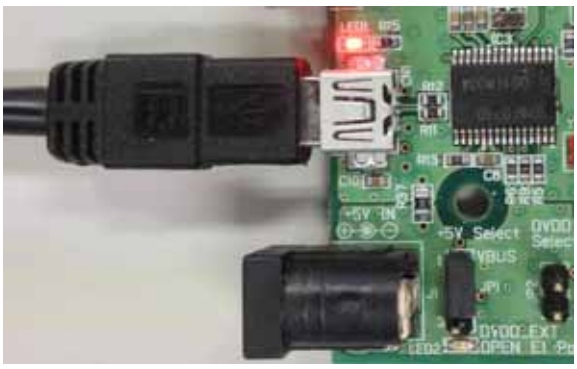


Figure 5.2 LED ON (for USB connection)

5.2.2 When using the E1 I/F connector

The following describes the board settings for programming the CPU with RFP using E1 interface.

① Board setup

Set the mode switch on EB-RL78/G1A to UART mode, and connect as shown in the figure below. Specify **Method Selected** for **Create a new work space** as the power supply method. For details, refer to **2.4.1 Power Supply**. Refer to **2.4.2 Mode Switching** for more information concerning how to switch modes.

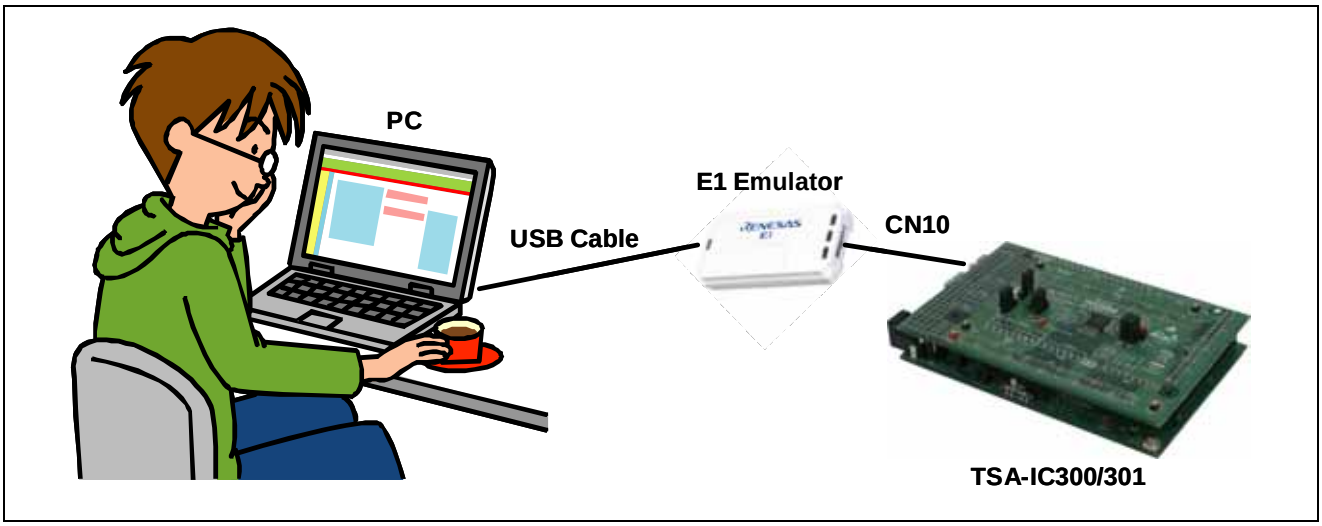


Figure 5.3 E1 Board Connection

② E1 emulator connection

Connect the E1 emulator to connector CN10.

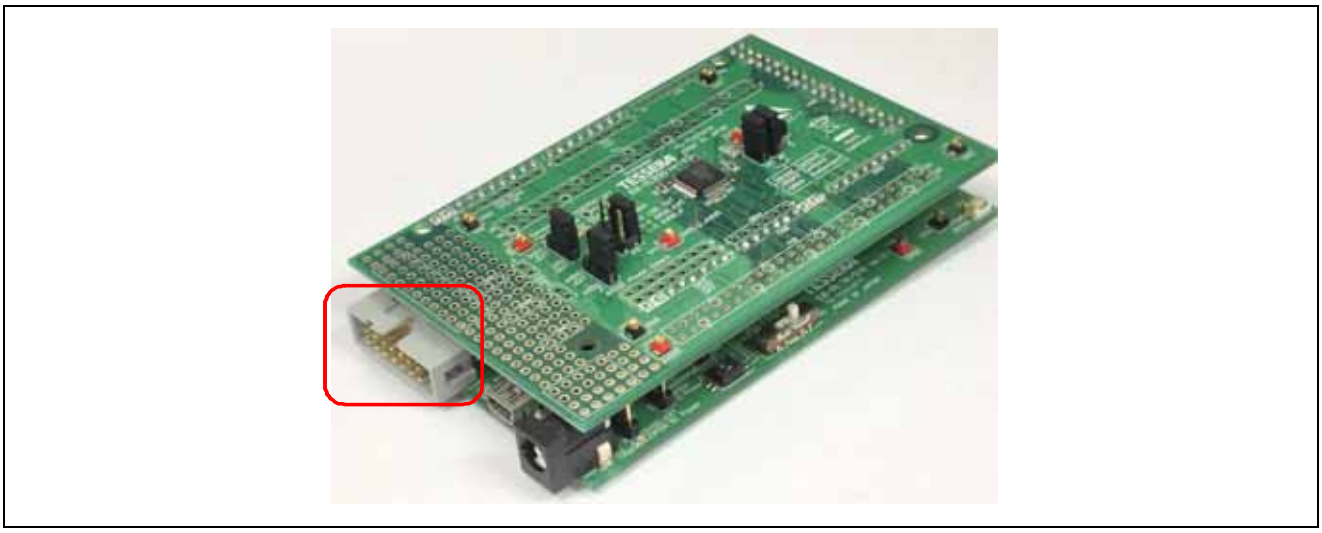


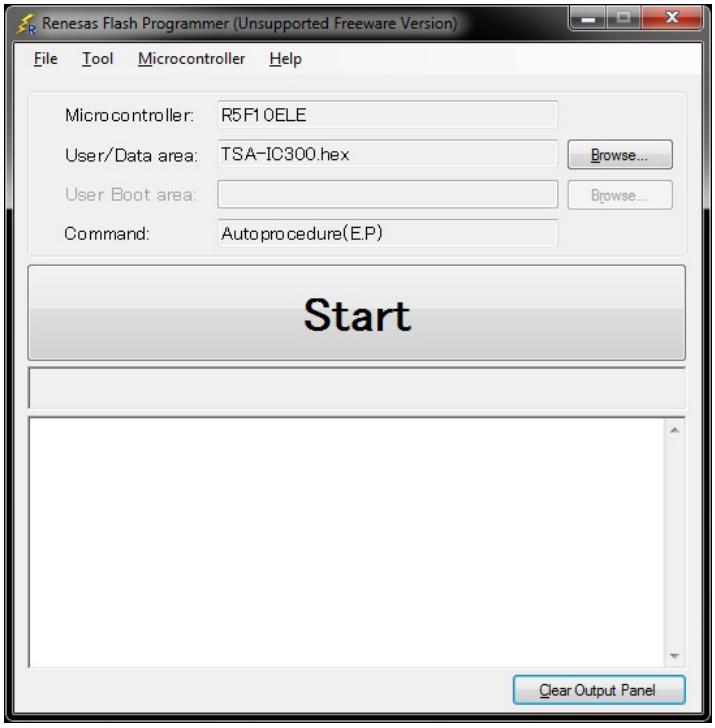
Figure 5.4 E1 Emulator I/F Connector Position

5.3 Programming the CPU with RFP

This section explains how to program the CPU using the Renesas Flash Programmer (RFP). There are two ways to program: using the EZ Emulator and using the E1 emulator

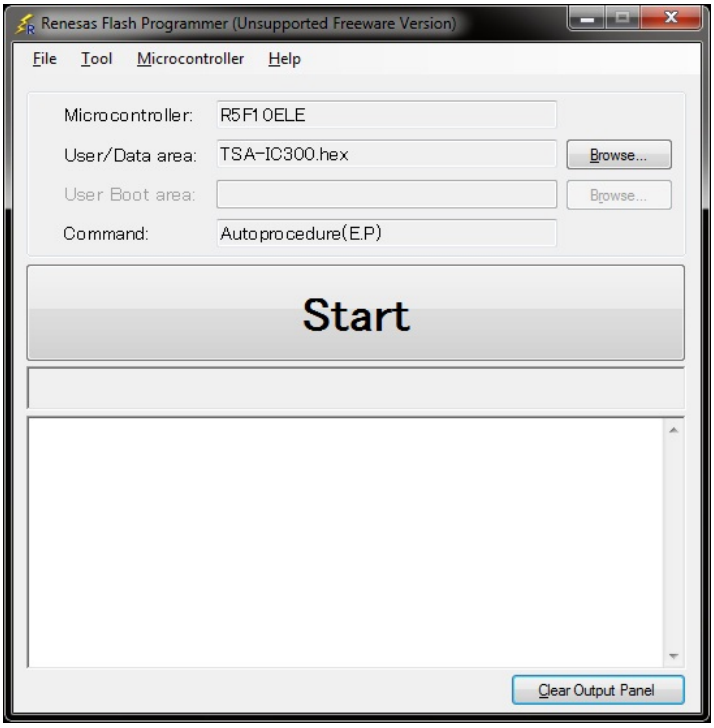
① Start an RFP workspace

Start the workspace you created in RFP as described in section 5.1. Select the workspace according to the tool you are using (if using E1, this includes the power supply method as well). Before programming the CPU, confirm that the correct file appears in the dialog box.

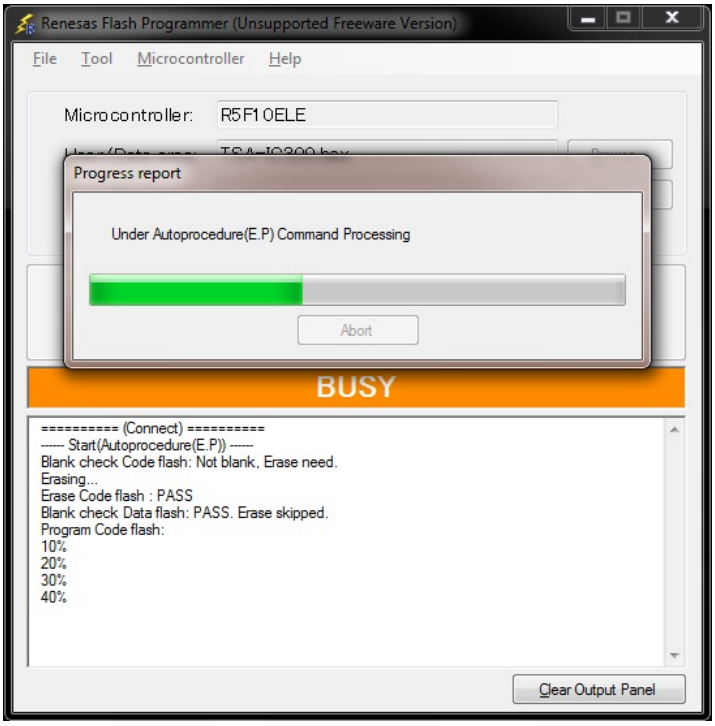


② Execute the program

Click start to execute the program.

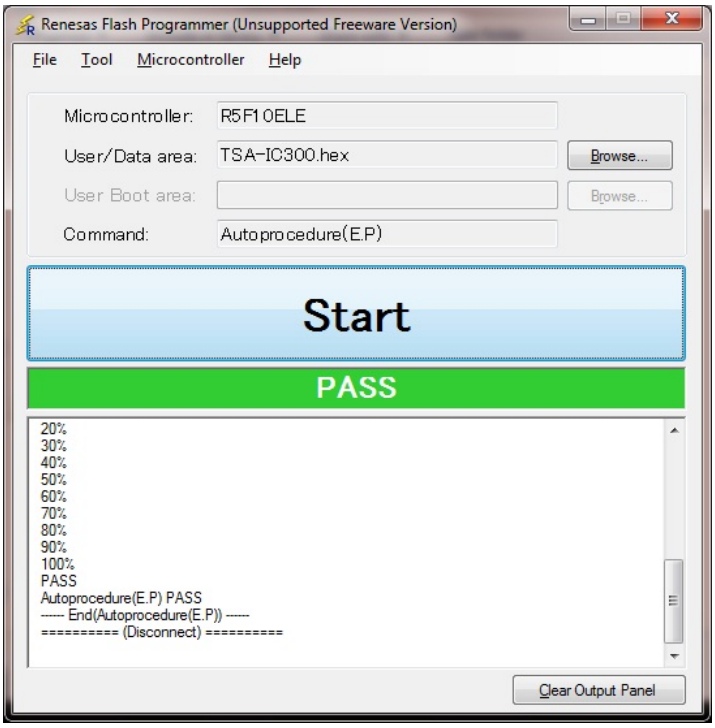


(1) The window will look similar to this when the command is in progress.



③ Programming completed

「The window will look like this when the programming procedure is successfully completed.



6. Hardware Documentation

6.1 Circuit diagrams

Circuit diagrams are provided on the following pages.

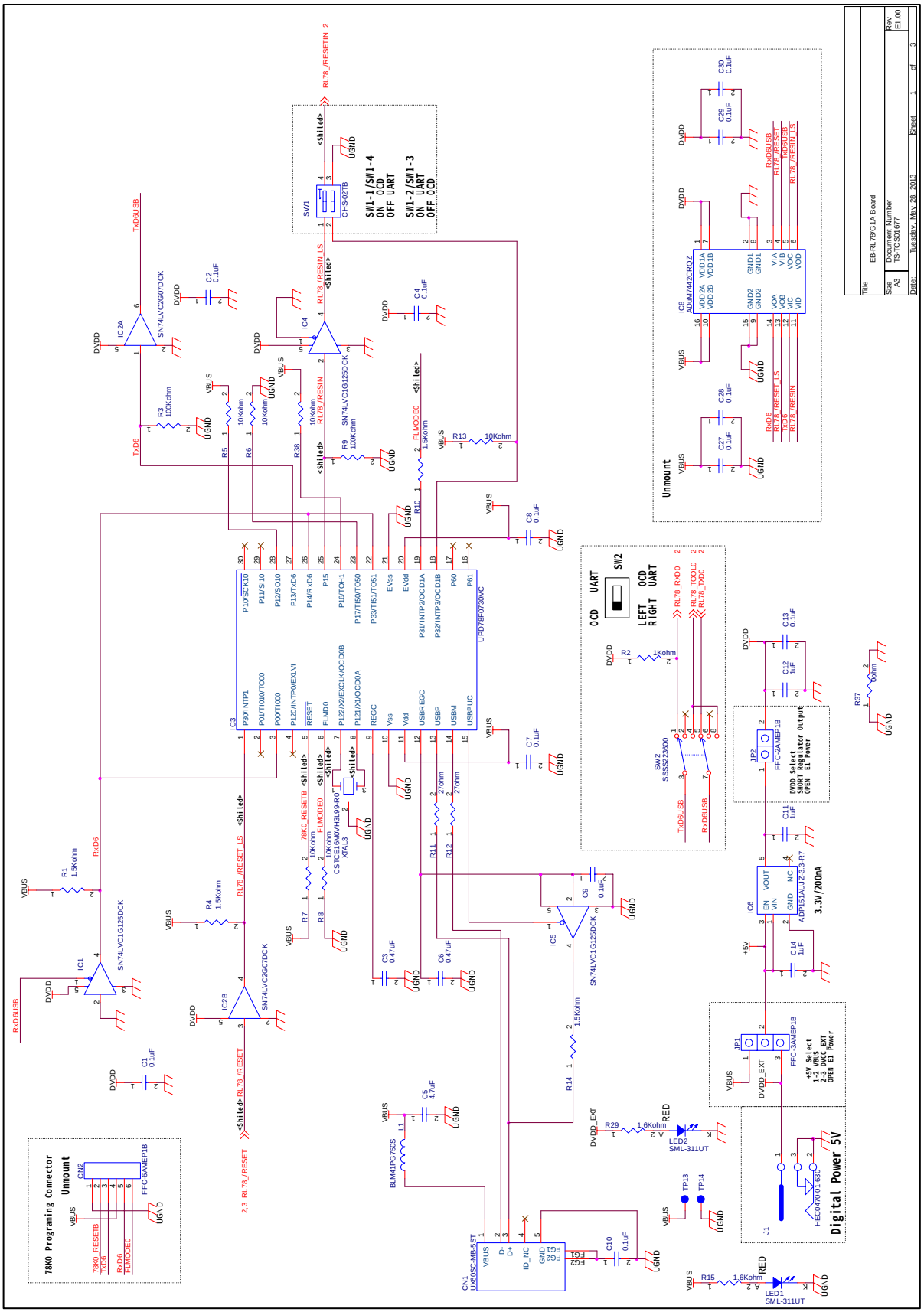


Figure 6.1 EB-RL78/G1A Circuit Diagram 1/3

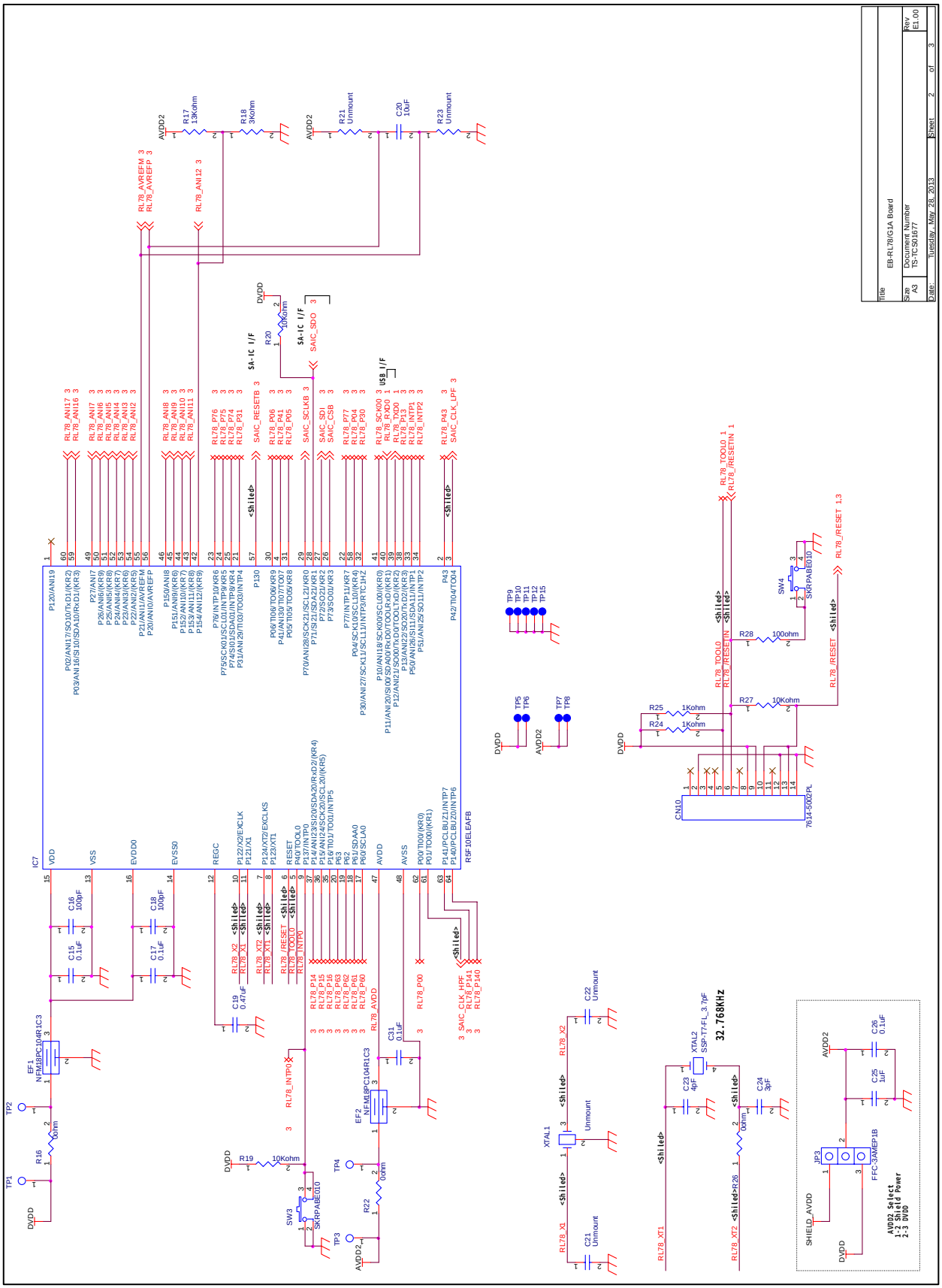


Figure 6.2 EB-RL78/G1A Circuit Diagram 2/3

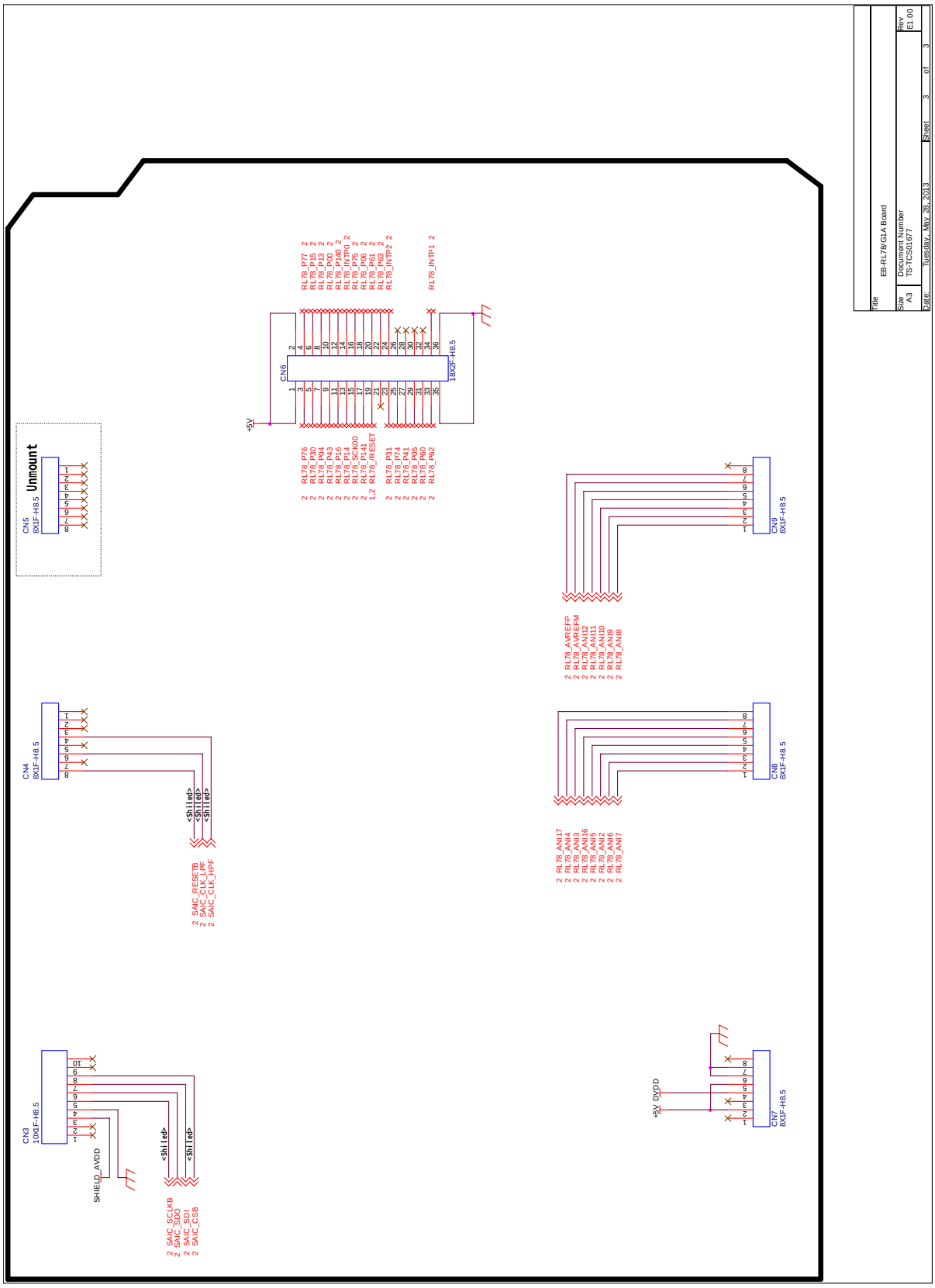


Figure 6.3 EB-RL78/G1A Circuit Diagram 3/3

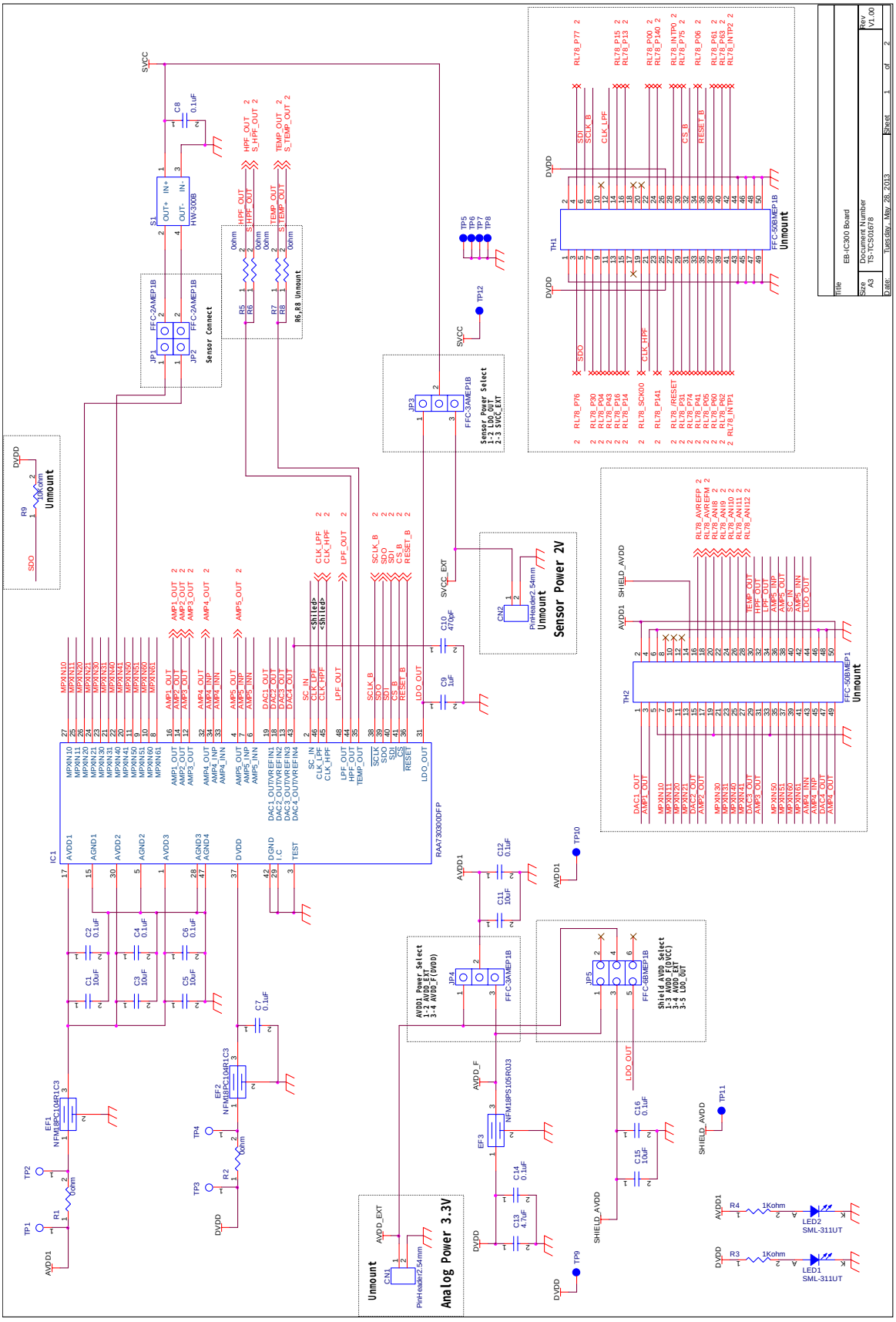


Figure 6.4 EB-IC300 EB-IC300 Circuit Diagram 1/2

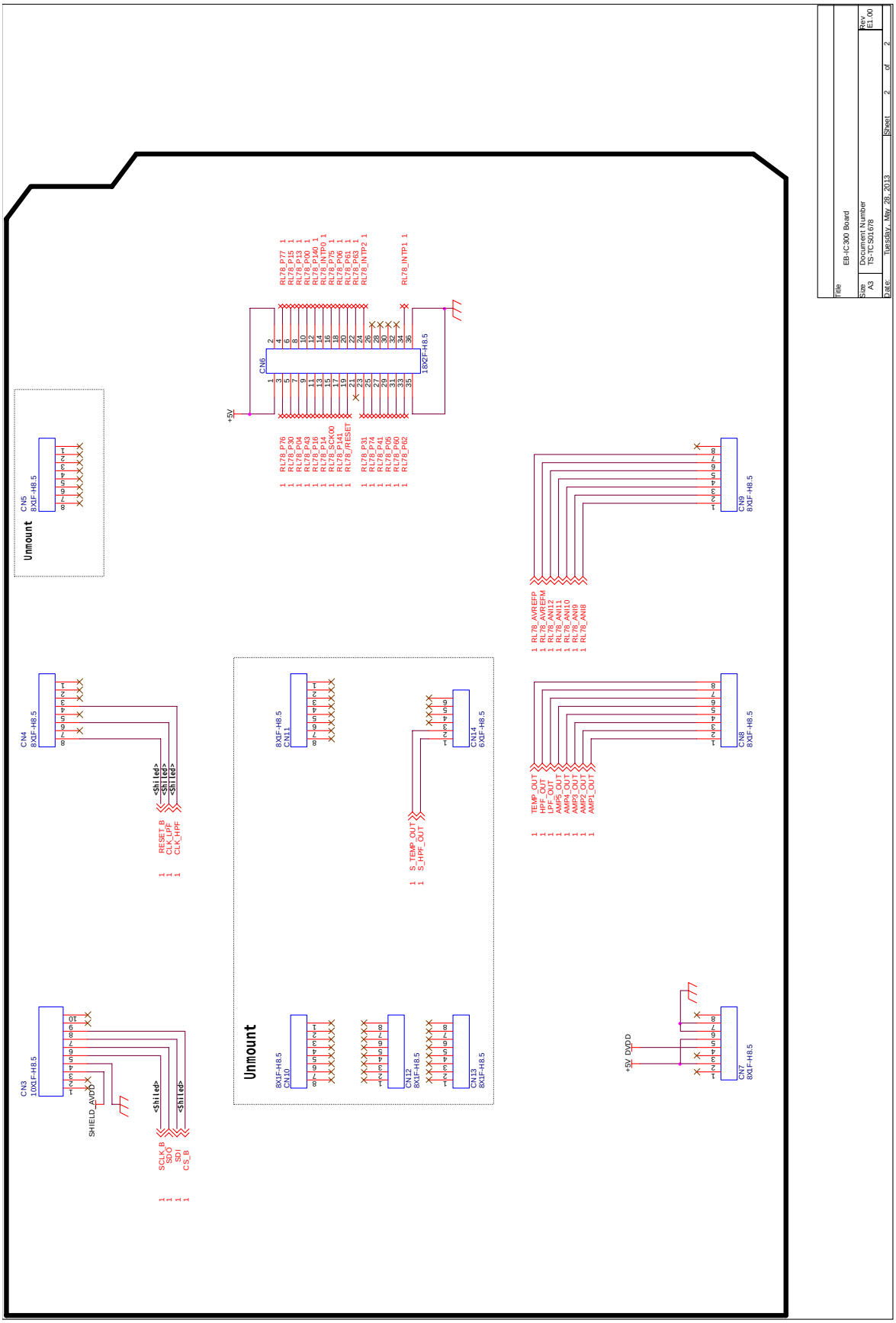


Figure 6.5 EB-IC300 Circuit Diagram 2/2

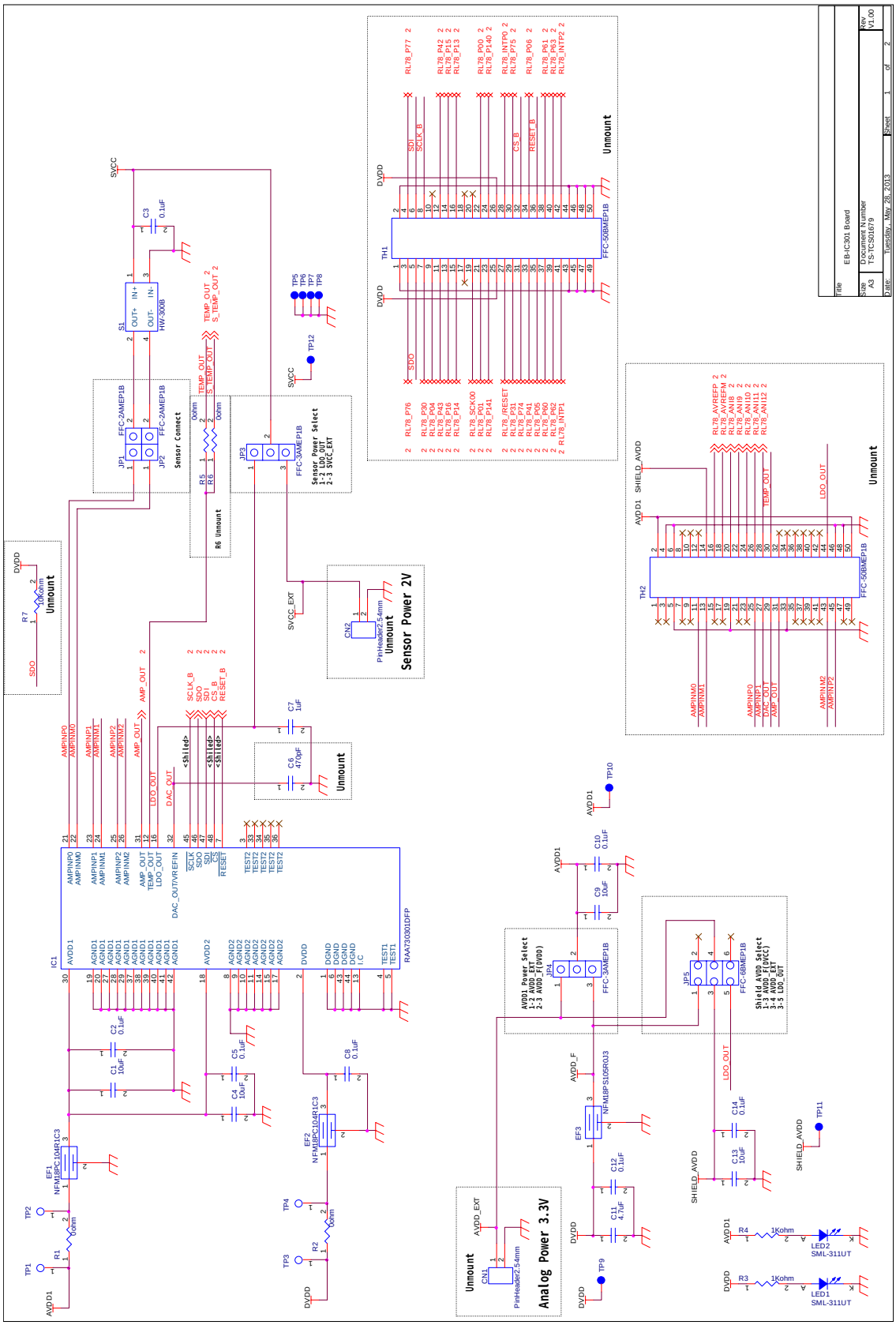


Figure 6.6 EB-IC301 EB-IC301 Circuit Diagram 1/2

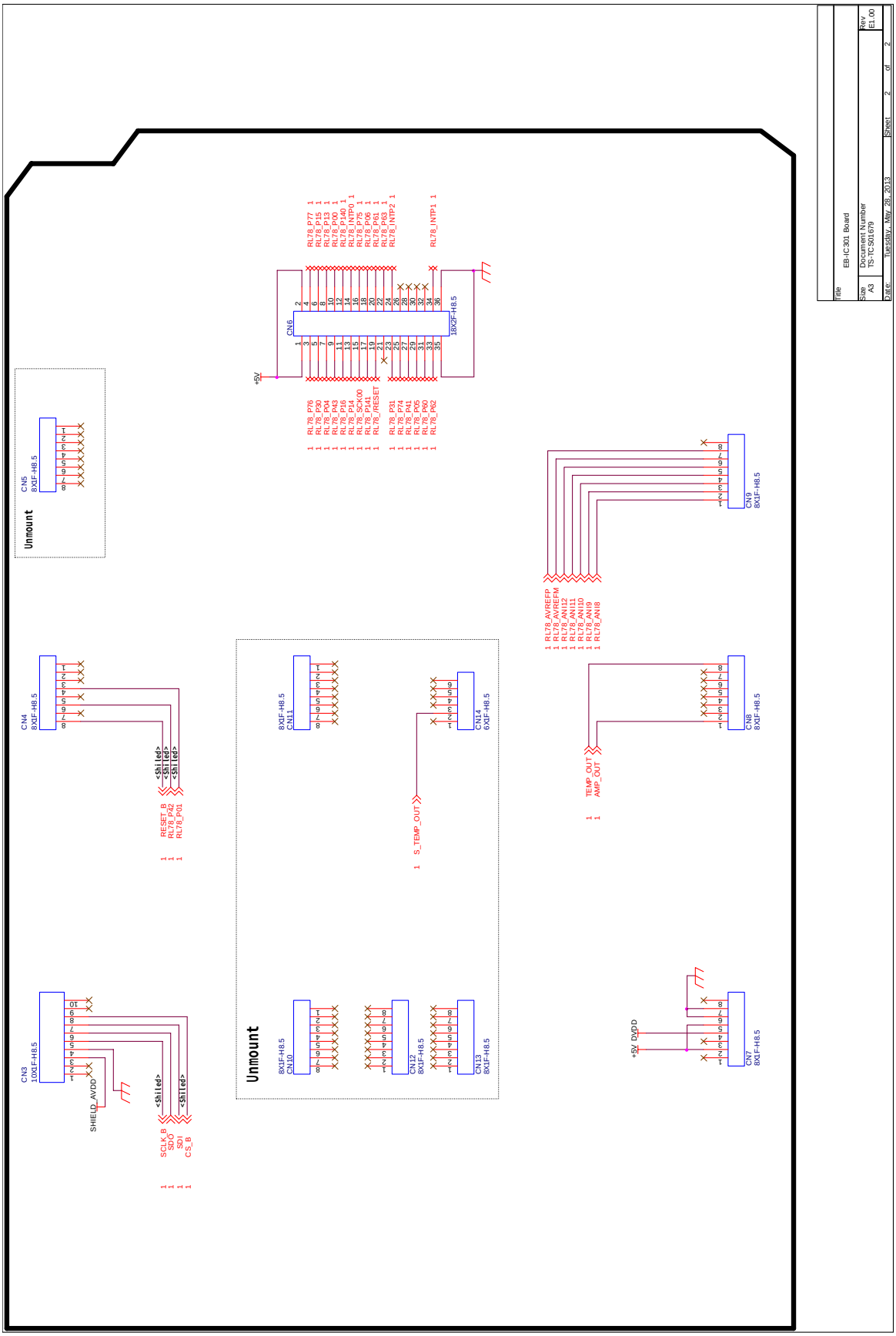


Figure 6.7 EB-IC301 Circuit Diagram 2/2

6.2 Component List

Component lists are provided on the following pages.

EB-RL78/G1A BOARD Parts List

Item	Quantity	Reference(Mount parts)	Reference(Unmount parts)	Parts name	Parts kind	Pats model number	Maker
1	1	CN1		UX60SC-MB-5ST	Connector	UX60SC-MB-5ST	HIROSE
2	1		CN2	FFC-6AMEP1B	Connector	FFC-6AMEP1B	HONDA TSUSHIN
3	1	CN10		7614-5002PL	Connector	7614-5002PL	3M
4	1	CN3		10X1F-H8.5	Connector	FSS-41085-10	HIROSUGI
5	4	CN4,CN7,CN8,CN9	CN5	8X1F-H8.5	Connector	FSS-41085-08	HIROSUGI
6	1	CN6		18X2F-H8.5	Connector	FSS-42085-18	HIROSUGI
7	12	C1,C2,C4,C7,C8,C9,C10,		0.1uF	Capacitor	GRM188R71H104KA93#	Murata
		C13,C15,C17,C26,C31	C27,C28,				
			C29,C30				
8	3	C3,C6,C19		0.47uF	Capacitor	GRM188B31E474KA75#	Murata
9	1	C5		4.7uF	Capacitor	GRM21BB31E475KA75#	Murata
10	4	C11,C12,C14,C25		1uF	Capacitor	GRM21BB11C105KA01#	Murata
11	2	C16,C18		100pF	Capacitor	GRM1882C1H101JA01#	Murata
12	1	C20		10uF	Capacitor	GRM21BR61C106KE15#	Murata
13	0		C22,C21	Unmount C1608	Capacitor	-	-
14	1	C23		4pF	Capacitor	GRM1882C1H4R0CZ01#	Murata
15	1	C24		3pF	Capacitor	GRM1883C1H3R0CZ01#	Murata
16	2	EF1,EF2		NFM18PC104R1C3	Filter	NFM18PC104R1C3	Murata
17	3	IC1,IC4,IC5		SN74LVC1G125DCK	IC	SN74LVC1G125DCK	TI
18	1	IC2		SN74LVC2G07DCK	IC	SN74LVC2G07DCK	TI
19	1	IC3		UPD78F0730MC	IC	uPD78F0730MC-CAB-AX	RENESAS
20	1	IC6		ADP151AUJZ-3.3-R7	Regulator	ADP151AUJZ-3.3-R7	AnalogDevices
21	1	IC7		R5F10ELEAFB	MCU	R5F10ELEAFB	Renesas
22	0		IC8	ADuM7442CRQZ	IC	ADuM7442CRQZ	AnalogDevices
23	2	JP3,JP1		FFC-3AMEP1B	Pin header	FFC-3AMEP1B	HONDA TSUSHIN
24	1	JP2		FFC-2AMEP1B	Pin header	FFC-2AMEP1B	HONDA TSUSHIN
25	1	J1		HEC0470-01-630	DC-JACK	HEC0470-01-630	HOSHIDEN
26	2	LED1,LED2		SML-311UT	LED	SML-311UT	ROHM
27	1	L1		BLM41PG750S	Filter	BLM41PG750SN1L	Murata
28	4	R1,R4,R10,R14		1.5Kohm	Resistor	RK73B1JTTD152J	KOA
29	3	R2,R24,R25		1Kohm	Resistor	RK73B1JTTD102J	KOA
30	2	R9,R3		100Kohm	Resistor	RK73B1JTTD104J	KOA
31	9	R5,R6,R7,R8,R13,R19,R20,		10Kohm	Resistor	RK73B1JTTD103J	KOA
		R27,R38					
32	2	R12,R11		27ohm	Resistor	RK73B1JTTD270J	KOA
33	2	R15,R29		1.6Kohm	Resistor	RK73B1JTTD162J	KOA
34	3	R22,R16,R37		0ohm R2125	Resistor	RK73Z2ATTD	KOA
35	1	R17		13Kohm	Resistor	RK73B1JTTD133J	KOA
36	1	R18		3Kohm	Resistor	RK73B1JTTD302J	KOA
37	0		R21,R23	Unmount R2125	Resistor	-	-
38	1	R26		0ohm	Resistor	RK73Z1JTTD	KOA
39	1	R28		100ohm	Resistor	RK73B1JTTD101J	KOA
40	1	SW1		CHS-02TB	Switch	CHS-02TB	
41	1	SW2		SSSS223600	Switch	SSSS223600	ALPS
42	2	SW3,SW4		SKRPABE010	Switch	SKRPABE010	ALPS
43	0		TP1,TP2,TP3,TP4	TPD10	Test point	TPD10	-
44	0		XTAL1	Unmount X	Crystals	-	-
45	1	XTAL2		SSP-T7-FL 3.7pF	Crystals	SSP-T7-FL 3.7pF	SII
46	1	XTAL3		CSTCE16M0VH3L99-R0	Crystals	CSTCE16M0VH3L99-R0	MURATA
47	5	TP5,TP6,TP7,TP8,TP13		HK-5-G	Test point	HK-5-G RED	MAC8
48	6	TP9,TP10,TP11,TP12,TP14,TP15		HK-5-G	Test point	HK-5-G BLACK	MAC8

EB-IC300 BOARD Parts List

Item	Quantity	Reference(Mount parts)	Reference(Unmount parts)	Parts name	Parts kind	Pats model number	Maker
1	0		CN1,CN2	PinHeader2.54mm	Connector	FFC-2AMEP1B	HONDA TSUSHIN
2	1	CN3		10X1F-H8.5	Connector	FFC-10AMEP1B	HONDA TSUSHIN
3	4	CN4,CN7,CN8,CN9	CN5,CN10,CN11,CN12,CN13	8X1F-H8.5	Connector	FFC-8AMEP1B	HONDA TSUSHIN
4	0		CN14	6X1F-H8.5	Connector	FFC-6AMEP1B	HONDA TSUSHIN
5	1	CN6		18X2F-H8.5	Connector	FFC-36BMEP1B	HONDA TSUSHIN
6	5	C1,C3,C5,C11,C15		10uF	Capacitor	GRM21BR61C106KE15#	Murata
7	8	C2,C4,C6,C7,C8,C12,C14,		0.1uF	Capacitor	GRM188R71H104KA93#	Murata
		C16					
8	1	C9		1uF	Capacitor	GRM21BB11C105KA01#	Murata
9	1	C10		470pF	Capacitor	GRM188B11H471KA01#	Murata
10	1	C13		4.7uF	Capacitor	GRM21BB31E475KA75#	Murata
11	2	EF2,EF1		NFM18PC104R1C3	Filter	NFM18PC104R1C3	Murata
12	1	EF3		NFM18PS105R0J3	Filter	NFM18PS105R0J3	Murata
13	1	IC1		RAA730300DFP	SAIC	RAA730300DFP	RENESAS
14	2	JP1,JP2		FFC-2AMEP1B	Pin header	FFC-2AMEP1B	HONDA TSUSHIN
15	2	JP3,JP4		FFC-3AMEP1B	Pin header	FFC-3AMEP1B	HONDA TSUSHIN
16	1	JP5		FFC-6BMEP1B	Pin header	FFC-6BMEP1B	HONDA TSUSHIN
17	2	R2,R1		0ohm	Resistor	RK73Z2ATTD	KOA
18	1	S1		HW-300B	Hall sensor	HW-300B	ASAHIKASEI
19	0		TH1,TH2	FFC-50BMEP1B	Pin header	FFC-50BMEP1B	HONDA TSUSHIN
21	0		TP1,TP2,TP3,TP4	TPD10	Test point	-	-
22	4	TP5,TP6,TP7,TP8		HK-5-G	Test point	HK-5-G B	MAC8
23	4	TP9,TP10,TP11,TP12		HK-5-G	Test point	HK-5-G R	MAC8
24	2	LED1,LED2		SML-311UT	LED	SML-311UT	Rohm
25	2	R3,R4		1Kohm	Resistor	RK73B1JTTD102J	KOA
26	0		T1,T2,T3,	-	-	-	-
			T7,T8,T9,T10,T11,				
			T12,T13,T14,T15,				
			T16,T17,T18,T19,				
			T20				
27	2	R5,R7	R6,R8	0ohm	Resistor	RK73Z1JTTD	KOA
28	0		R9	10Kohm	Resistor	RK73B1JTTD103J	KOA

EB-IC301 BOARD Parts List

Item	Quantity	Reference(Mount parts)	Reference(Unmount parts)	Parts name	Parts kind	Pats model number	Maker
1	0		CN1,CN2	PinHeader2.54mm	Connector	FFC-2AMEP1B	HONDA TSUSHIN
2	1	CN3		10X1F-H8.5	Connector	FFC-10AMEP1B	HONDA TSUSHIN
3	4	CN4,CN7,CN8,CN9	CN5,CN10,CN11,CN12,CN13	8X1F-H8.5	Connector	FFC-8AMEP1B	HONDA TSUSHIN
4	0		CN14	6X1F-H8.5	Connector	FFC-6AMEP1B	HONDA TSUSHIN
5	1	CN6		18X2F-H8.5	Connector	FFC-36BMEP1B	HONDA TSUSHIN
6	4	C1,C4,C9,C13		10uF	Capacitor	GRM21BR61C106KE15#	Murata
7	7	C2,C3,C5,C8,C10,C12,C14		0.1uF	Capacitor	GRM188R71H104KA93#	Murata
8	0		C6	470pF	Capacitor	GRM188B11H471KA01#	Murata
9	1	C7		1uF	Capacitor	GRM21BB11C105KA01#	Murata
10	1	C11		4.7uF	Capacitor	GRM21BB31E475KA75#	Murata
11	2	EF2,EF1		NFM18PC104R1C3	Filter	NFM18PC104R1C3	Murata
12	1	EF3		NFM18PS105R0J3	Filter	NFM18PS105R0J3	Murata
13	1	IC1		RAA730301DFP	SAIC	RAA730301DFP	RENESAS
14	2	JP1,JP2		FFC-2AMEP1B	Pin header	FFC-2AMEP1B	HONDA TSUSHIN
15	2	JP4,JP3		FFC-3AMEP1B	Pin header	FFC-3AMEP1B	HONDA TSUSHIN
16	1	JP5		FFC-6BMEP1B	Pin header	FFC-6BMEP1B	HONDA TSUSHIN
17	2	R2,R1		0ohm	Resistor	RK73Z2ATTD	KOA
18	1	S1		HW-300B	Hall sensor	HW-300B	ASAHIKASEI
19	0		TH2,TH1	FFC-50BMEP1B	Pin header	FFC-50BMEP1B	HONDA TSUSHIN
20	0		TP1,TP2,TP3,TP4	TPD10	Test point	-	-
21	4	TP5,TP6,TP7,TP8		HK-5-G	Test point	HK-5-G B	MAC8
22	4	TP9,TP10,TP11,TP12		HK-5-G	Test point	HK-5-G R	MAC8
23	2	LED1,LED2		SML-311UT	LED	SML-311UT	Rohm
24	2	R3,R4		1Kohm	Resistor	RK73B1JTTD102J	KOA
25	0		T1,T2,T3,	-	-	-	-
			T7,T8,T9,T10,T11,				
			T12,T13,T14,T15,				
			T16,T17,T18,T19,				
			T20				
26	1	R5	R6	1Kohm(1608)	Resistor	RK73Z1JTTD	KOA
27	0		R7	10Kohm	Resistor	RK73B1JTTD103J	KOA

6.3 Board Dimensions

Figure 6.8 shows the board dimensions and connector positions. The pitch for all extension connector through-holes is 2.54mm. These dimensions and positions are the same for both EB-IC300 and EB-IC301.

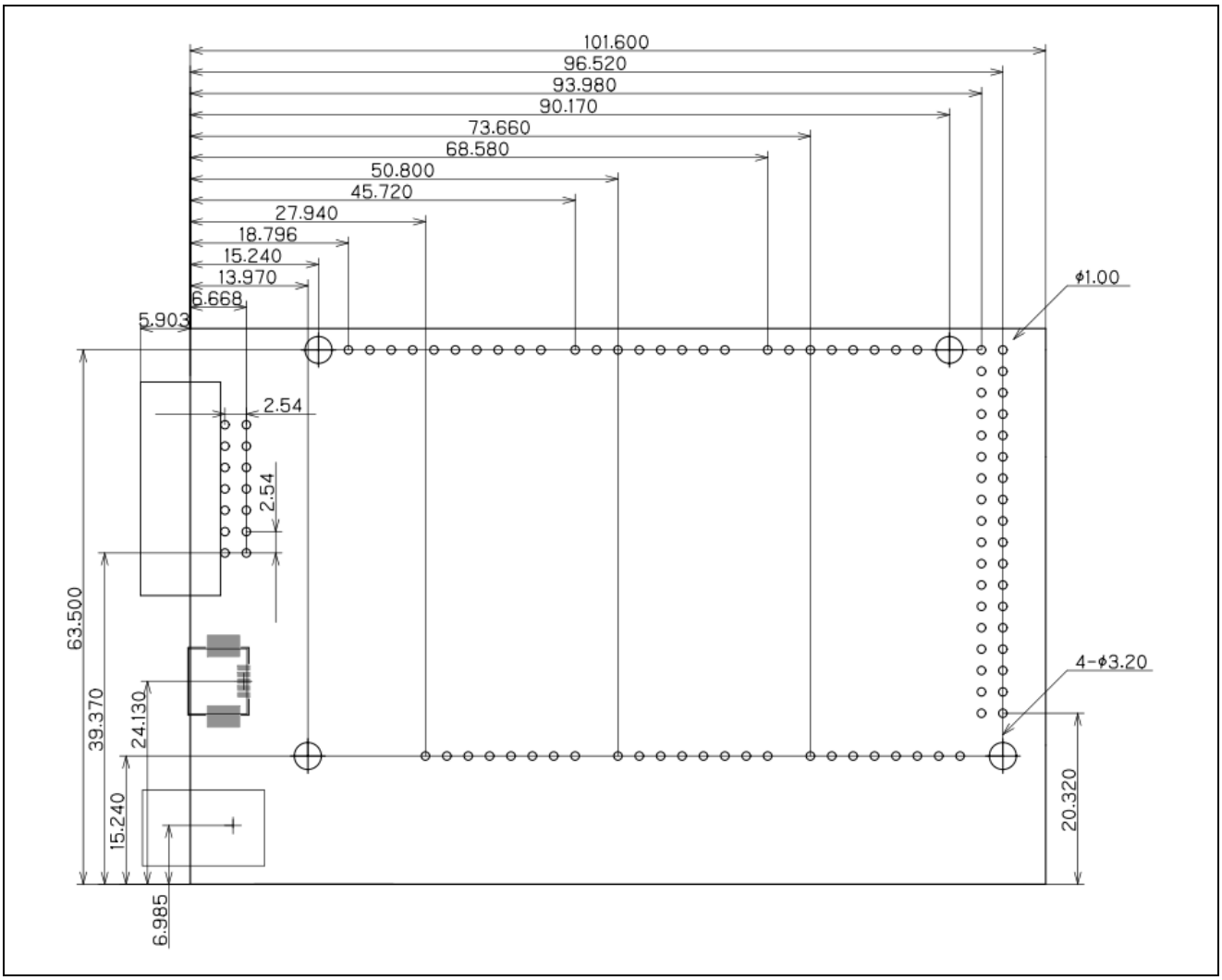


Figure 6.8 EB-RL78/G1A Board Dimensions

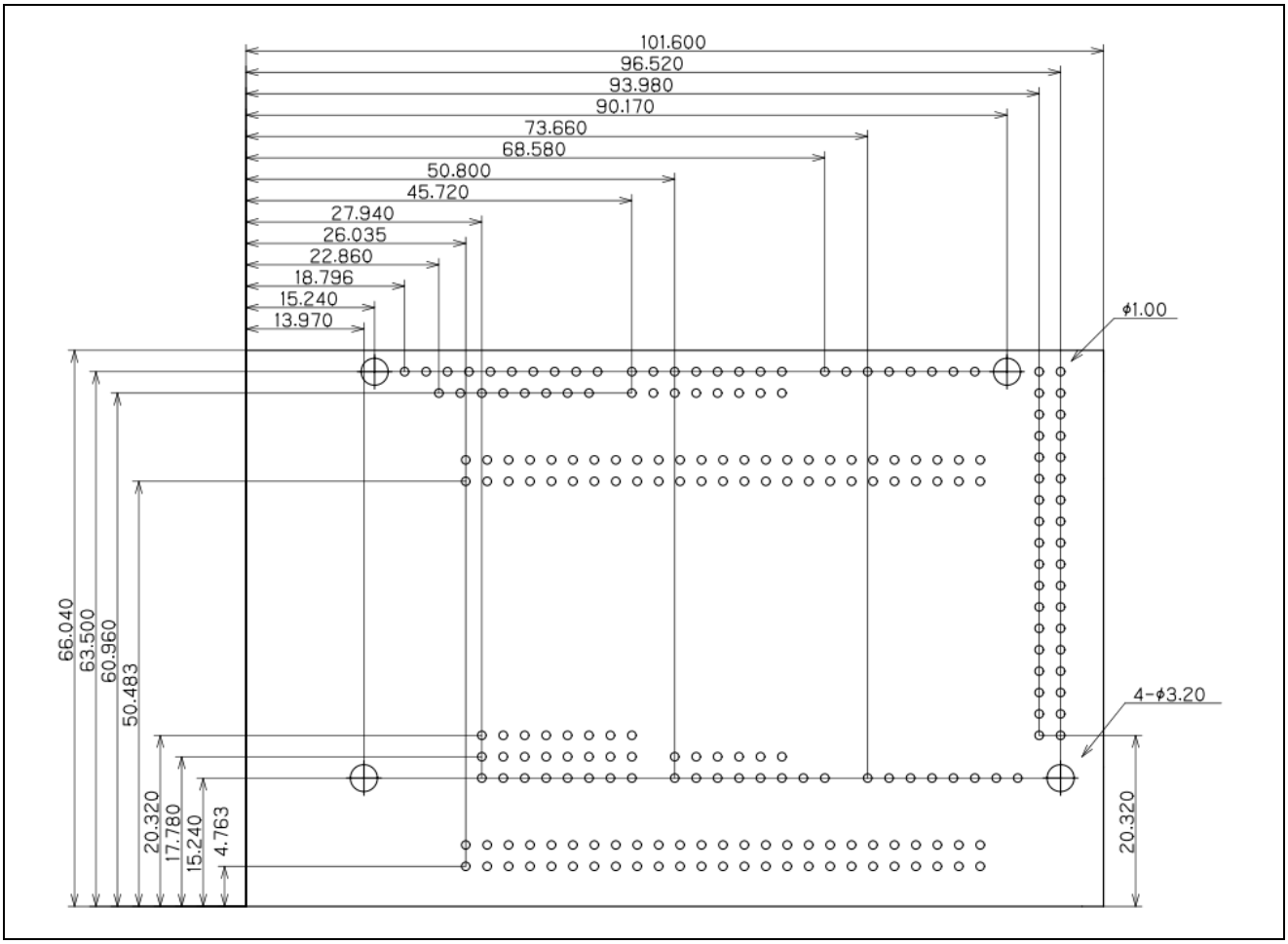


Figure 6.9 EB-IC30x Board Dimensions

6.4 Component Layout

The following figures show the component layout for each board surface. Refer to circuit diagrams and component lists for component references and part numbers.

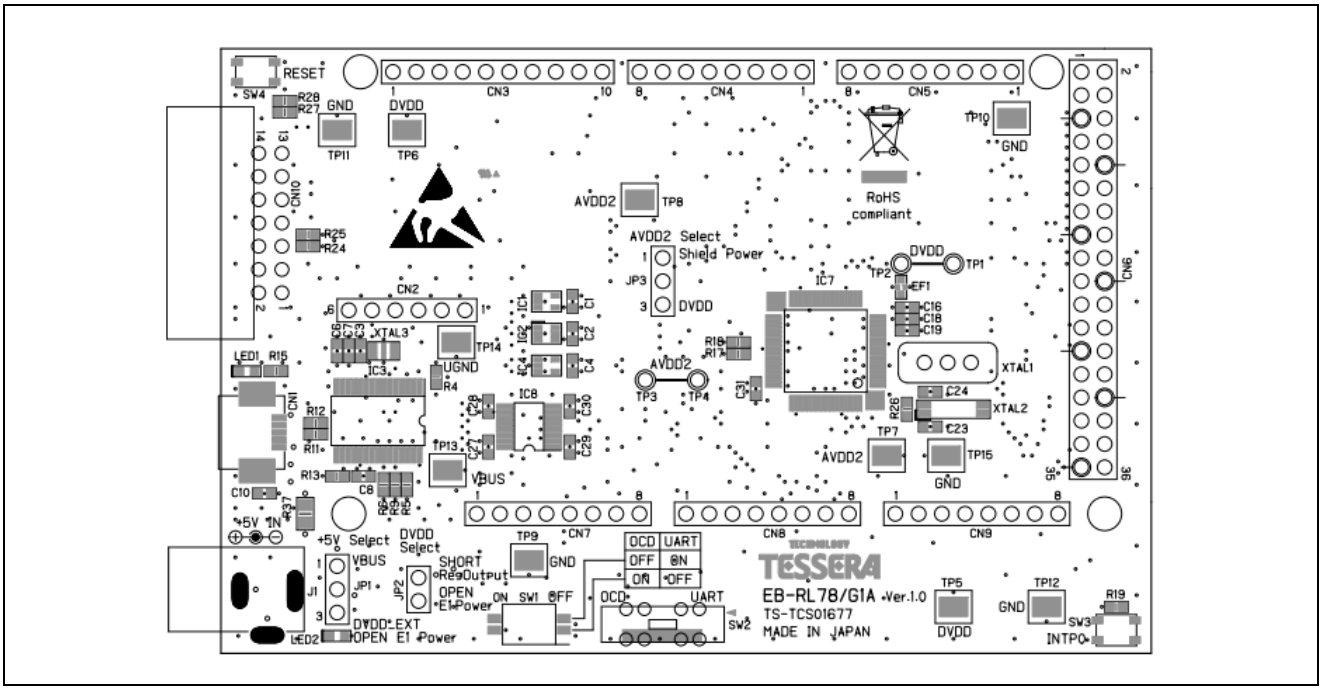


Figure 6.10 EB-RL78/G1A Component Layout (Front)

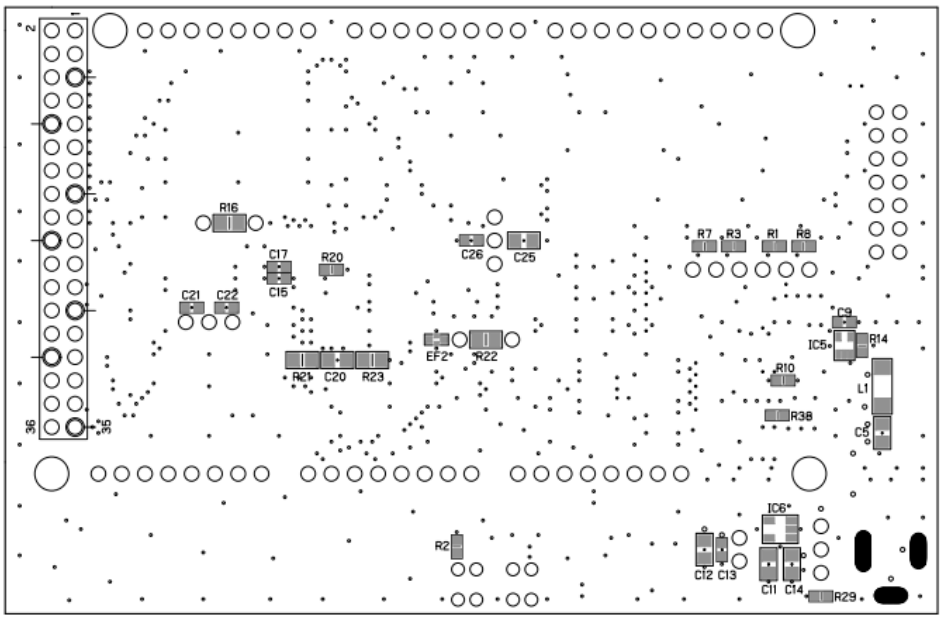


Figure 6.11 EB-RL78/G1A Component Layout (Back)

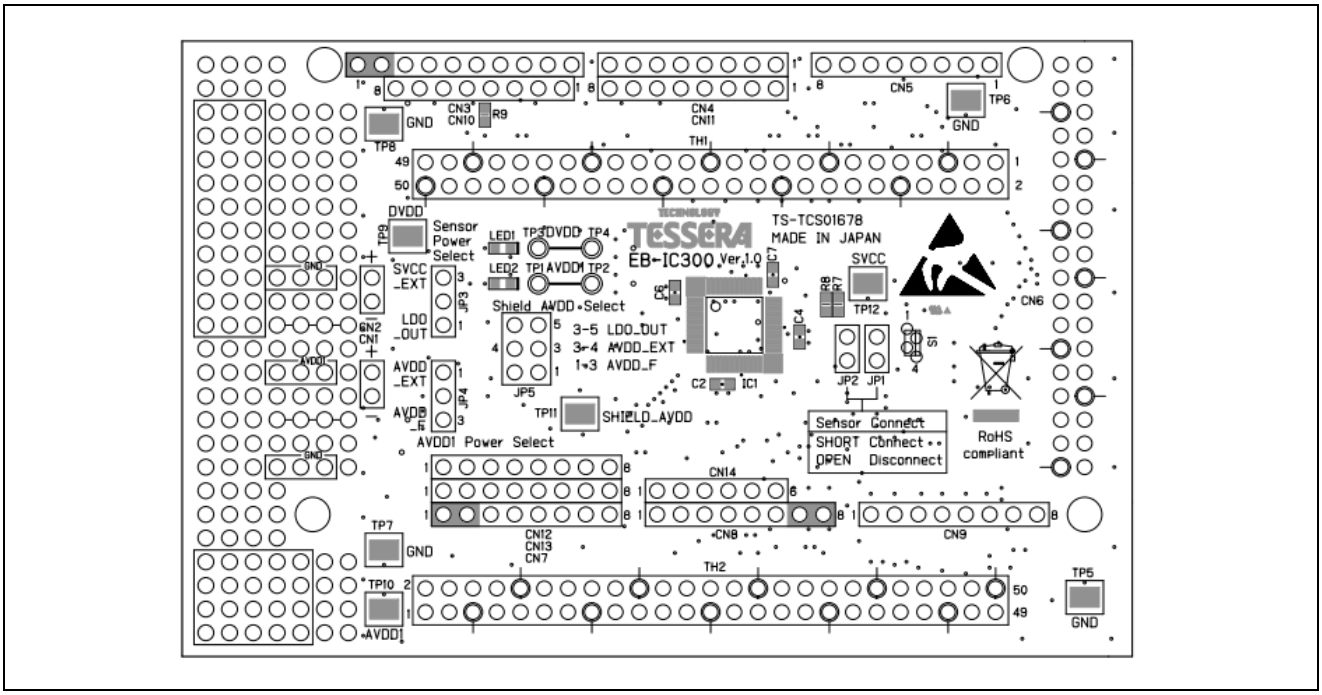


Figure 6.12 EB-IC300 Component Layout (Front)

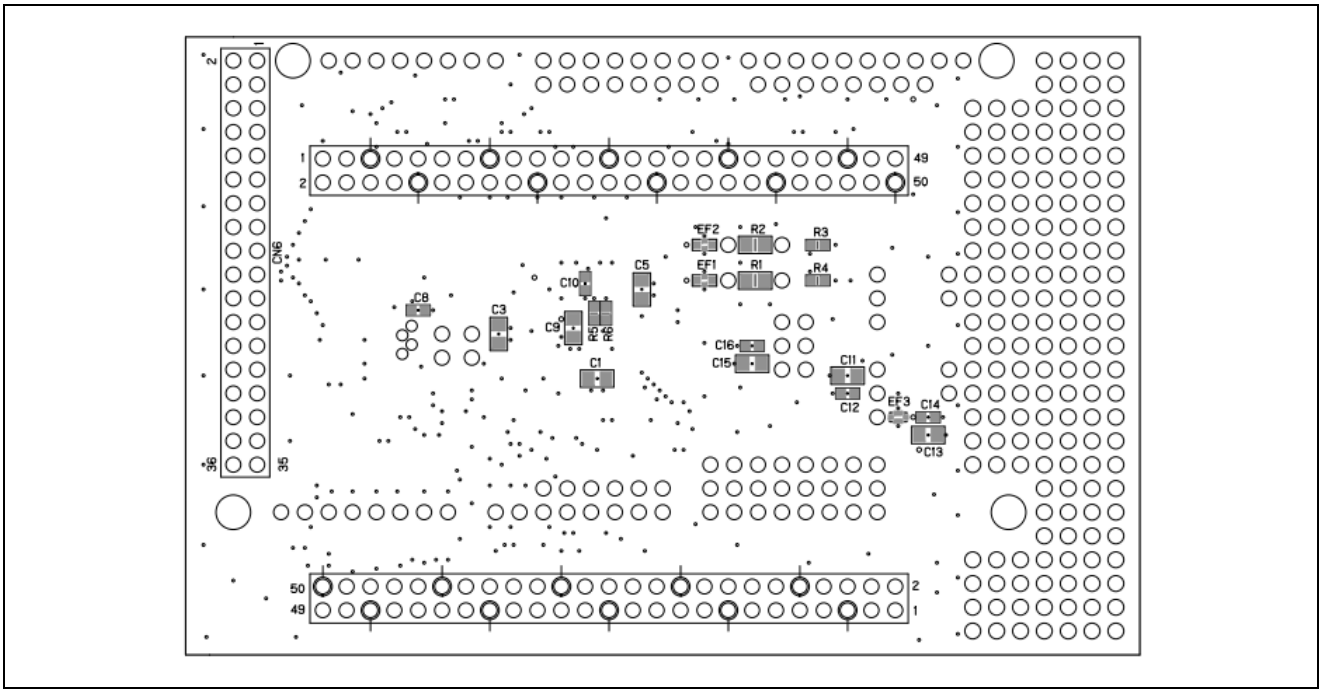


Figure 6.13 EB-IC300 Component Layout (Back)

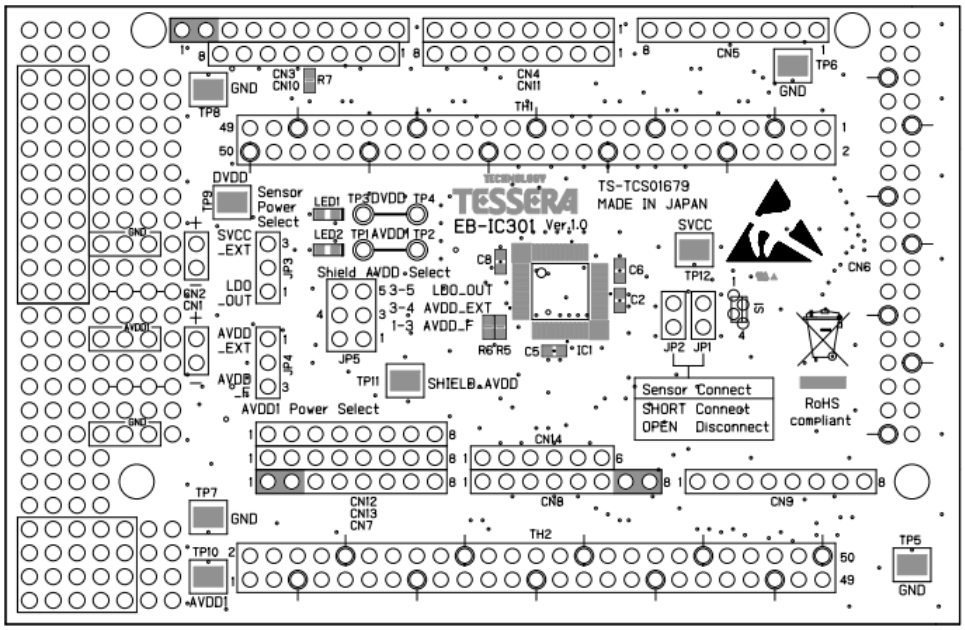


Figure 6.14 EB-IC301 Component Layout (Front)

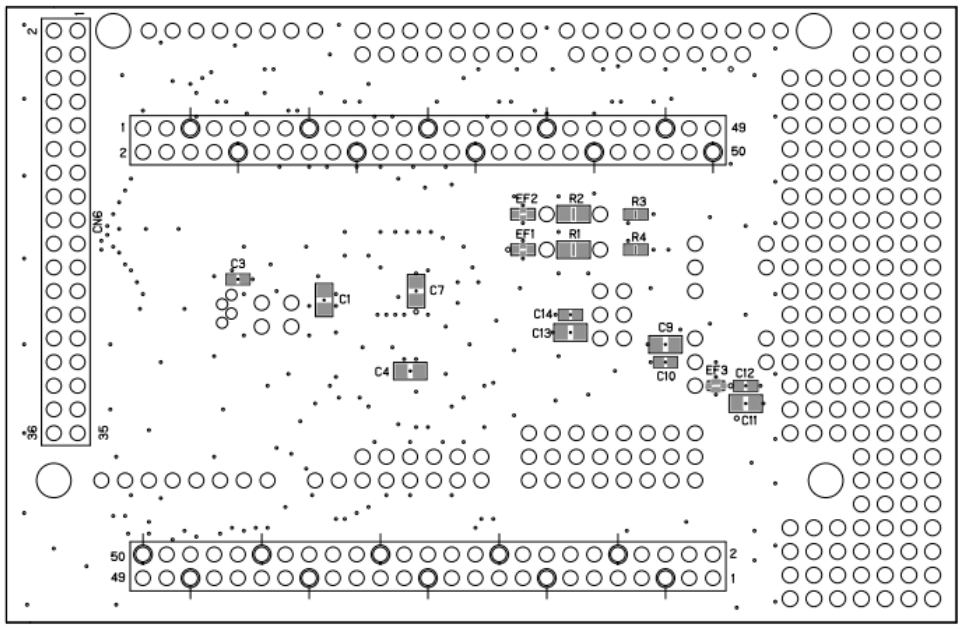


Figure 6.15 EB-IC301 Component Layout (Back)